Regional Biological Assessment

For Beach Activities Along the
Atlantic and Gulf Coasts of Florida

South Atlantic Jacksonville (SAJ)

Atlantic Coast – Fernandina/Kings Bay to Key West
Gulf Coast – Thousand Islands to Apalachee Bay

South Atlantic Mobile (SAM)

Gulf Coast – Apalachee Bay to Alabama State Line

Table of Contents

1.00 PROPOSED PROJECT 1
2.00 ACTIVITIES COVERED 1
2.01 Shore Protection Projects 1
2.01.1 Civil Works – Federally Authorized Hurricane and Storm Damage Reduction Projects 1
2.01.2 Regulatory - Non-Federal Permitted Shoreline Protection Projects........ 2
2.01.3 Glossary of Shoreline Protection Terms 3
2.02 Emergency Preparedness, Response, and Recovery - Coastal Emergencies (P.L. 84-99 appropriations). 4
2.03 Off-loading Dredge Material Management Areas (DMMA's). 4
2.04 Sand Bypassing / Back passing 4
2.05 Sand Sharing / Sand Re-distribution........ 5
2.06 Beach Disposal of Dredged Material – Dredging of Federal Navigation Channels ... 5
2.07 Nearshore Disposal of Dredged Material – Dredging of Federal Navigation Channels 5
2.08 Beach Grooming........ 6
2.09 Beach Scraping 6
2.10 Beach Raking 6
2.11 Beach Tilling........ 6
3.00 DREDGING METHODS 6
3.01 Truck Haul........ 6
3.02 Hydraulic Dredges........ 6
3.02.1 Pipeline Dredges - Cutterhead Suction Dredge........ 7
3.02.2 Hopper Dredge 8
3.02.3 Sidecaster and Dustpan Dredges 9
3.03 Mechanical Dredges........ 10
4.00 BEACH PLACEMENT ACTIVITIES 10
4.01 Past and Present Actions........ 10
4.02 Beach Placement of Sediment - Construction Operations........ 13
4.02.1 Pre-Project Coordination........ 13
4.02.2 Mobilization........ 13
4.02.3 Staging Area........ 13
4.02.4 Pipeline Preparation and Connection........ 14
4.02.5 Beach Construction........ 14
4.02.6 Demobilization........ 16
4.03 Beach Placement of Sediment – Associated Hard Structure Features 16
5.00 EXISTING CONDITIONS........ 19
6.00 SPECIES CONSIDERED UNDER THIS ASSESSMENT 21
7.00 IMPACTS TO LISTED THREATENED AND ENDANGERED SPECIES........ 23
7.01 General Impacts........ 23
7.02 Species Accounts 24
7.02.1 Bald Eagles........ 24
7.02.2 Roseate Tern........ 26
7.02.3 Piping Plover........ 28

7.02.4 Snowy Plover ... 34
7.02.5 West Indian Manatee ... 40
7.02.6 Beach Mice ... 45
7.02.7 Sea Turtles ... 50
7.02.8 Beach Jacquemontia ... 69
7.02.9 Deltoid Spurge ... 71
8.00 Cumulative Impacts ... 72
9.00 Commitments to Reduce Impacts to Listed Species ... 73
10.00 Summary Effect Determination ... 76
11.00 Literature Cited ... 77

Appendix 1 FDEP Sediment Compatibility Requirements

Appendix 2 Past and Present Shore Protection Activities

Appendix 3 Piping Plover Critical Habitat

Appendix 4 Shorebird Survey Guidelines

Appendix 5 Florida Red Knot Location and Density

Appendix 6 Beach Mice Critical Habitat

Appendix 7 Sea Turtle Nesting Data

County Maps
Green Sea Turtle
Leatherback
Loggerhead
Hawksbill and Kemps Ridley

Appendix 8 Sea turtle monitoring guidelines

1.00 PROPOSED PROJECT

This Regional Biological Assessment (RBA) is prepared in accordance with Section 7 of the Endangered Species Act, as amended. The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida, encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Districts. Additionally, this assessment will also cover the placement and rehabilitation of groins, shore-connected breakwaters, or other hard structure features utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. The intent of this assessment is to address impacts to threatened and endangered species and their critical habitat in the project area along the Florida coastline. This assessment assumes sediment being placed on the beach meets the Florida Department of Environmental Protection's (FDEP) sediment compatibility requirements for beach and nearshore placement (62B-41.007 (2) (j-k)) (http://www.dep.state.fl.us/legal/Rules/mainrulelist.htm) (Appendix 1) and does not address actual sediment sources and/or characteristics. Projects that fall outside the scope of FDEP compatibility standards are not covered under this assessment. For all projects and associated actions that do not follow the scope of traditional beach placement operations, as discussed in this assessment, additional coordination and amendments to this document may be required. This assessment will include all Regulatory, Civil Works, Military, and FEMA actions and encompasses, but is not limited to, the following beach activities: (1) shore protection projects, (2) coastal emergencies (PL 84-99 appropriations), (3) off-loading dredged material management areas (DMMA's), (4) sand by-passing/back-passing, (5) sand sharing / sand re-distribution, (6) beach disposal of dredged material from navigation channels, (7) nearshore disposal (seaward of mean high water and below mean low water), (8) beach grooming, (9) beach scraping, (10) beach raking, and (11) beach tilling.

2.00 ACTIVITIES COVERED

2.01 Shore Protection Projects.

2.01.1 Civil Works – Federally Authorized Hurricane and Storm Damage Reduction Projects

Authorities: 1946 Shore Protection Cost Sharing Act (P.L. 79-727), as amended; Section 55, WRDA 1974 (P.L. 93-251); 1956 Beach Nourishment Act, (P.L. 84-826); Sections 103 (c) (5) and (d), WRDA 1986, (P.L. 99-662); Section 402, WRDA 1986, (P.L. 99-662) as amended by Section 14, WRDA 1988 (P.L. 100-676), Section 202 (c), WRDA 1996, (P.L. 104-303) and Section 209, WRDA 2000 (P.L. 104-303); Section 215 (a), WRDA 1999 (P.L. 106-53)

Provisions:

-Establishes Federal policy to assist in the construction, but not the maintenance, of works for the improvement and protection of the shores of the U.S. against erosion by waves or currents.

-Section 55, WRDA 1974 (P.L. 93-251): The Corps can provide technical and engineering assistance to non-Federal public interests in developing structural and non-structural methods of preventing damages attributable to shore and stream bank erosion.

-1956 Beach Nourishment Act, (P.L. 84-826): Federal assistance in periodic beach nourishment is provided on the same basis as new construction when it would be the most suitable and economical remedial measure.

-Section 402, WRDA 198, (P.L. 99-662) as amended Non-Federal sponsors must comply with Federal flood insurance program and prepare floodplain management plan within one year after signing PCA and implement plan one year after project completion.

-ASA (CW) policy stipulates that Corps projects be formulated primarily for hurricane and storm reduction.

-The Administration's shore protection policy is that projects that support mainly recreation activities or projects in tourist or recreation areas that provide substantial income to regional and local economies can be undertaken solely by non-Federal interests.

2.01.2 Regulatory - Non-Federal Permitted Shoreline Protection Projects

Typically, legal authority for Corps permits is from (1) Section 404 of the Clean Water Act, (2) Section 10 of the River and Harbor Act, and (3) Section 103 of the Marine Protection, Research, and Sanctuaries Act.

(1) Section 404 of the Clean Water Act (33 USC 1344).

Section 404 of the Clean Water Act (33 USC 1344) requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the discharge of dredged or fill material into all waters of the United States, including wetlands. Discharges of fill material generally include, without limitation: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and sub-aqueous utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material. A Corps permit is required whether the work is permanent or temporary. Examples of temporary discharges include dewatering of dredged material prior to final disposal, and temporary fills for access roadways, cofferdams, storage, and work areas.

(2) Section 10 of the River and Harbor Act of 1899 (33 USC 403).

Section 10 of the River and Harbor Act of 1899 (33 USC 403) requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the construction of any structure in or over any navigable water of the United States. Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, re-channelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking. It further includes, without limitation, any wharf, dolphin, weir, boom breakwater, jetty, groin, bank protection (e.g. riprap, revetment, bulkhead), mooring structures such as pilings, aerial or sub-aqueous power transmission lines, intake or outfall pipes, permanently moored floating vessel, tunnel, artificial canal, boat ramp, aids to navigation, and any other permanent, or semi-permanent obstacle or obstruction.

(3) Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 USC 1413).

Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 USC 1413), as amended, requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the transportation of dredged material for the purpose of dumping it in ocean waters. Discharges of dredged or fill materials into territorial seas also requires authorization under Section 404 of the Clean Water Act.

2.01.3 Glossary of Shoreline Protection Terms

(1) Beach Nourishment.

Beach nourishment is a term used for Federal shore protection projects describing the introduction of material along a shoreline to supplement the natural littoral drift. According to the State of Florida's JCP program, nourishment is defined as the periodic maintenance of a restored beach by the replacement of sand.

There are several reasons for nourishing a shore. These include: (1) controlling erosive forces by providing a sacrificial area as a source of littoral material, (2) supplementing littoral drift to offset particular actions or works, and (3) replenishing reserves of littoral material normally available in sand dunes. The effects of beach nourishment are generally short-lived (i.e. as long as the supply of material exists) (http://chl.erdc.usace.army.mil).

(2) Beach Renourishment / Periodic Nourishment

Beach renourishment and periodic nourishment are terms used interchangeably for Federal shore protection projects to describe the rate of beach fill interval in which the buffer zone of the initial beach fill needs to be re-established to provide appropriate levels of shoreline protection.

(3) Beach Fill.

Beach fills are quantities of sand placed on the shoreline by mechanical means, such as dredging and pumping from offshore or inshore deposits or overland hauling and dumping by trucks. The resulting beach provides some protection to the area behind it and also serves as a valuable recreational resource.

The beach fill functions as an eroding buffer zone. As large waves strike it, sand is carried offshore and deposited in a bar. As the bar grows, it causes incoming waves to break farther offshore. The useful life of such a beach, which depends on how quickly it erodes, can be completely eliminated in a short period of time by a rapid succession of severe storms. Therefore, as erosion continues, it is necessary to periodically add more fill.

The rate at which new fill must be added depends on the relative coarseness of the fill material in relation to the native beach material. Generally, if fill material is coarser than the native material, the fill erodes more slowly and if it is finer, it erodes more quickly.

(4) Beach Restoration.

The term beach restoration is often used in defining beach construction projects permitted through the Regulatory Division and in many cases is used interchangeably with beach nourishment. Essentially, beach restoration is the initial placement of sand on an eroded beach in order to bring the beach profile to an elevation and width that existed at some point in time prior to documented erosion events. The purpose of beach restoration is to restore recreational benefits, habitat functions, and storm protection capabilities of the beach.

2.02 Emergency Preparedness, Response, and Recovery - Coastal Emergencies (P.L. 84-99 appropriations).

P.L. 84-99 and prior legislation allow Corps participation in planning and preparedness for all natural disasters (P.L. 84-99 and P.L. 101-640), flood fighting and rescue operations (FCA of 1941), emergency repair and restoration of flood damaged or destroyed flood control works (FCA of 1941), emergency protection, repair, and restoration of Federal hurricane or shore protection project structures damaged or destroyed by extraordinary storm (P.L. 87-874), non-structural alternatives to the repair or restoration of flood damaged flood control works (P.L. 104-303), and advance measures to prevent loss of life and catastrophic property damage when there is an imminent threat of unusual flooding (P.L. 84-99).

2.03 Off-loading Dredge Material Management Areas (DMMA's).

Dredge material management areas are confined upland disposal sites used, in many cases, as a least cost disposal option for US Army Corps of Engineers dredging operations. These sites are managed for the storage of dredge material through the use of dikes and spillways to confine material over time to allow for settling of solids and dewatering through spillways. Some DMMA's are constructed to be used as a least cost option to store dredged material over a short term period until cubic yardage capacity of the DMMA is reached. Dredge Material Management Areas that contain beach compatible material can be off-loaded to the beach at appropriate pump out intervals as a beach disposal option to restore storage capacity. Furthermore, depending on location and compatibility, DMMA's can be used as a sand source for shoreline protection projects.

2.04 Sand Bypassing / Back-passing.

Sand bypassing is the hydraulic or mechanical movement of sand around impediments to long-shore transport of sediment (i.e. deep inlet channels, jetty structures, etc.); from an area of accretion to a down drift area of erosion. Bypassing commonly takes place using two methods. First, pumping equipment and an associated pipeline route can be constructed that transfers sand from the up-drift side of the littoral barrier, and deposits it as a slurry of sand and water on the down-drift side. Depending on the rate of accretion on the up-drift side, this equipment can be run continuously, or on an as needed basis. A second method involves the dredging or excavation of sand from the up-drift side, using dredges or heavy machinery, and the placement of this material on the down-drift side by the dredge (water based transport), or by trucks and other heavy equipment (land based transport). In addition to its use as a mechanism to restore natural sediment transport patterns, sand bypassing is sometimes used as a method to keep navigational channels and other harbor areas free from excess sedimentation in an effort to reduce maintenance-dredging requirements.

Contrary to sand bypassing, sand back-passing is the mechanical or hydraulic movement of sand that artificially accretes on the up-drift side of an inlet, or within an inlet system, to a location farther up-drift, but within the same coastal cell (i.e. between the same two inlets). The disposal of material associated with bypassing and back passing is not intended to provide shore protection benefits and; therefore, does not contain a shore protection design template.

2.05 Sand Sharing / Sand Re-distribution.

The excavation of sand from an accretional portion of a beach and placement of that sand onto an erosional portion of the beach that is located within the same coastal cell (i.e. between the same two inlets).

2.06 Beach Disposal of Dredged Material – Dredging of Federal Navigation Channels.

The placement of beach compatible dredged material on the adjacent beach above mean high water, as a least cost disposal option for nearby maintenance dredging of Federally authorized channels. Dredging associated with beach disposal often occurs in inlet complexes and consists of removing littoral material from navigation channels and keeping it within the littoral system by placing the material on nearby adjacent beaches so that sediment budgets are maintained. Beach disposal of dredged material is considered a beneficial use of dredged material and is not intended to provide shore protection benefits and; therefore, does not contain a shore protection design template.

2.07 Nearshore Disposal of Dredged Material – Dredging of Federal Navigation Channels.

Nearshore disposal is the placement of beach compatible dredged material seaward of the mean high water line and within the littoral zone. Nearshore disposal includes both the placement of material in the intertidal (swash) and subtidal portions of the littoral zone. This disposal method may be performed as a least cost disposal option for nearby maintenance dredging, in order to keep beach compatible dredged material within the littoral system. Material can be placed in the littoral zone by hydraulic cutterhead pipeline or split-hull hopper dredge. Nearshore disposal of dredged material is not intended to provide shore protection and; therefore, does not contain a shore protection design template. However, placement of material in the nearshore zone (intertidal and subtidal) allows for the material to be carried by currents and waves within the littoral system potentially resulting in beach accretion. Though an engineered design template is not a component of nearshore disposal, the dredged material may replenish the eroding beach in a natural manner (Herbich, 2000).

2.08 Beach Grooming.

The occasional redistribution or re-grading of the beach berm associated with a constructed beach project, located landward of the MHW line, in order to restore the appropriate project design template and prevent or alleviate ponding or the formation of swales, gullies, or escarpments.

2.09 Beach Scraping.

The excavation of sand from the foreshore beach (i.e. below the MHW line), and mechanically moving it to the eroded dune bluff or backshore side of the beach, in an effort to expedite the post-storm recovery of the beach berm.

2.10 Beach Raking.

Collecting and removing litter or debris from a beach without penetrating into the sand by more than 4 inches.

2.11 Beach Tilling.

Pulling a series of tines, which penetrate approximately 24-36 inches into the surface of the beach berm in order to prevent or alleviate compaction of the sand that could otherwise hinder the nesting of marine turtles.

3.00 DREDGING METHODS

For the purposes of this assessment, dredging methods discussed will be those, which lend themselves capable of placing sediment on the beach. The placement of sediment on the beach can be accomplished by (1) truck haul of upland sediment sources or (2) hydraulically pumping dredged material to the beach using a hopper or cutterhead suction dredge (http://www.usace.army.mil/publications/eng-manuals/em1110-2-5025/toc.htm).

3.01 Truck Haul.

Truck hauling of sediment, for the purpose of beach nourishment, is often associated with the use of upland borrow sources. Sediment is excavated from the upland borrow site, using a backhoe or other excavation technique, and placed in dump trucks to be hauled to the disposal locations. Depending on the project design and site conditions, material is dumped on-site and distributed to fill the appropriate template using other heavy equipment (bulldozers, backhoes, etc.). With the exception of dune construction operations, truck hauled material from an upland borrow source is often saturated to achieve a density comparable to hydraulically placed sand.

3.02 Hydraulic Dredges.

Hydraulic dredges are characterized by their use of a centrifugal pump to dredge sediment and transport a slurry of dredged material and water to identified discharge areas. The ratio of water to sediment within the slurry mixture is controlled to maximize efficiency. The main types of hydraulic dredges are pipeline and hopper dredges. Less common hydraulic dredges include side-caster and dustpan dredges.

3.02.1 Pipeline Dredges - Cutterhead Suction Dredge.

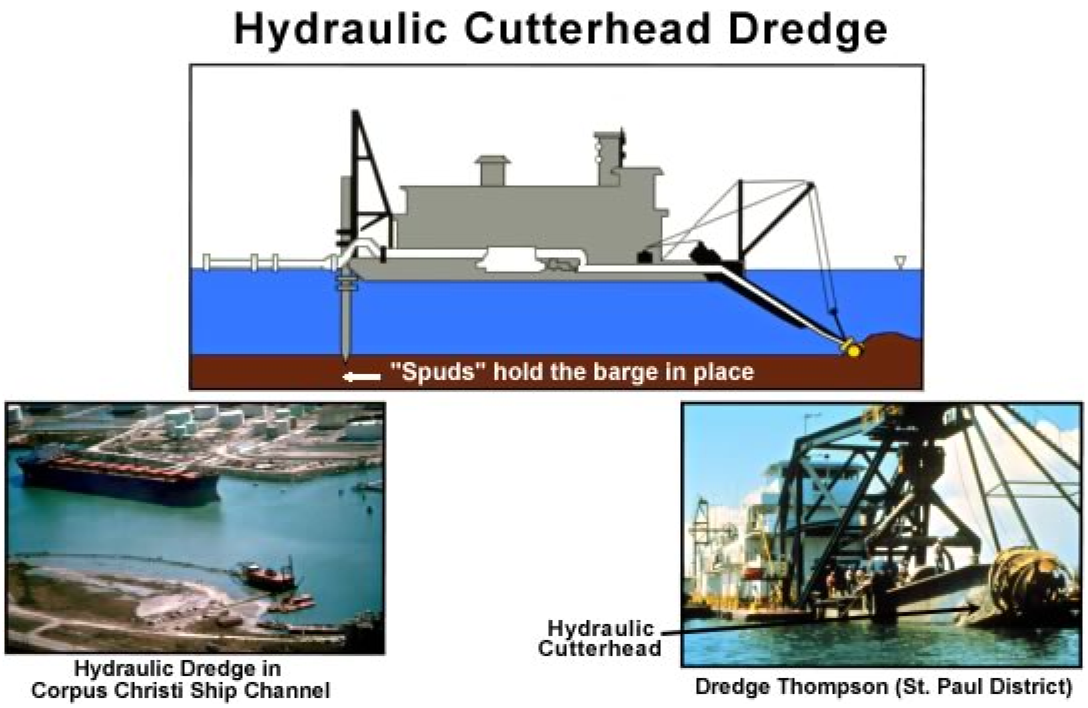
Pipeline dredges are designed to handle a wide range of materials including clay, hardpan, silts, sands, gravel, and some types of rock formations without blasting. They are used for new work and maintenance in projects where suitable disposal areas are available and operate in an almost continuous dredging cycle resulting in maximum production, economy, and efficiency. Pipeline dredges are capable of dredging in shallow or deep water and have accurate bottom and side slope cutting. Limitations of pipeline dredges include relative lack of mobility, long mobilization and demobilization, inability to work in high wave action and currents, and are impractical in high traffic areas.

Pipeline dredges are rarely self-propelled and; therefore, must be transported to and from the dredge site. Pipeline dredge size is based on the inside diameter of the discharge pipe which commonly range from 6" to 36." They require an extensive array of support equipment including pipeline (floating, shore, and submerged), boats (crew, work, survey), barges, and pipe handling equipment. Most pipeline dredges have a cutterhead on the suction end. A cutterhead is a mechanical device that has rotating teeth to break up or loosen the bottom material so that it can be sucked through the dredge. Some cutterheads are rugged enough to break up rock for removal (Figure 1).

During the dredging operation a cutterhead suction dredge is held in position by two spuds at the stern of the dredge, only one of which can be on the bottom while swinging. There are two swing anchors some distance from either side of the dredge, which are connected by wire rope to the swing wenches. The dredge swings to port and starboard alternately, passing the cutter through the bottom material until the proper depth is achieved. The dredge advances by "walking" itself forward on the spuds. This is accomplished by swinging the dredge to the port, using the port spud and appropriate distance, then the starboard spud is dropped and the port spud raised. The dredge is then swung an equal distance to the starboard and the port spud is dropped and the starboard spud raised.

Cutterhead pipeline dredges work best in large areas with deep shoals, where the cutterhead is buried in the bottom. A cutterhead removes dredged material through an intake pipe and then pushes it out the discharge pipeline directly into the disposal site. Most, but not all, pipeline dredging operations involve upland disposal of the dredged material. Therefore, the discharge end of the pipeline is connected to shore pipe. When effective pumping distances to the disposal site become too long, a booster pump is added to the pipeline to increase the efficiency of the dredging operation (USACE, 1993).

Figure 1. Cutterhead pipeline dredge schematic.



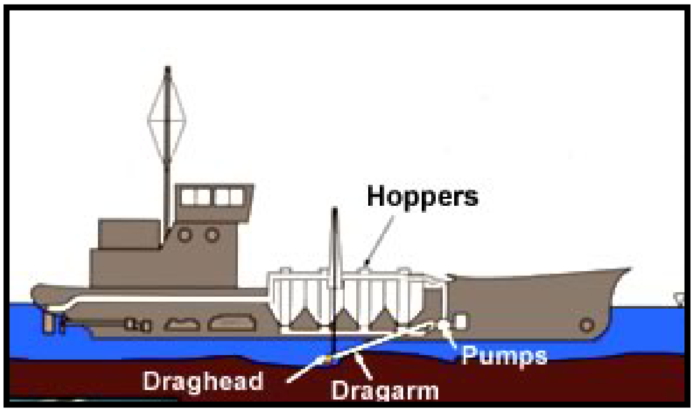
3.02.2 <u>Hopper Dredge</u>.

The hopper dredge, or trailing suction dredge, is a self-propelled ocean-going vessel with a section of the hull compartmented into one or more hoppers. Fitted with powerful pumps, the dredges suck dredged material from the channel bottom through long intake pipes, called drag arms, and store it in the hoppers. Normal hopper dredge configuration has two dragarms, one on each side of the vessel. A dragarm is a pipe suspended over the side of the vessel with a suction opening called a draghead for contact with the bottom. The dredged slurry is distributed within the vessels hopper allowing for solids to settle out and the water portion of the slurry to be discharged from the vessel during operations through its overflow system. When the hopper attains a full load, dredging stops and the ship travels to an in-water disposal site, where the dredged material is discharged through the bottom of the ship by splitting the hull. Some hopper dredges are capable of pumping the material back out of the vessel and through a series of shore-pipe to a designated disposal location (See Section 4.02).

Hopper dredges are well suited to dredging heavy sands. They can maintain operations safely, effectively, and economically in relatively rough seas and because they are mobile, they can be used in high-traffic areas. They are often used at ocean entrances and offshore, but cannot be used in confined or shallow areas. Hopper dredges can move quickly to disposal sites under their own power, but since the dredging stops during the transit to and from the disposal area, the operation loses efficiency if the haul distance is too far. Hopper dredges also have several limitations. Considering their normal operating conditions, hopper dredges cannot dredge

continuously. The precision of hopper dredging is less than other types of dredges; therefore, they have difficulty dredging steep side banks and cannot effectively dredge around structures.
In order to minimize the risk of incidental takes of sea turtles, the Corps requires the use of sea turtle deflecting dragheads on all hopper-dredging projects where the potential for sea turtle interactions exist. The leading edge of the deflector is designed to have a plowing effect of at least 6” depth when the drag head is being operated. Appropriate instrumentation is required on board the vessel to insure that the critical “approach angle” is attained in order to satisfy the 6” plowing depth requirement (USACE, 1993).

Figure 2. Hopper dredge schematic.



3.02.3 <u>Sidecaster and Dustpan Dredges.</u>

There are special hydraulic dredges called sidecasters and dustpan dredges. Both of these dredges are used to remove loosely compacted, coarse-grained material and place it in areas close to the navigation channel. Side-casting of dredged material, done mainly on some smaller projects, is also limited to fairly unique situations and environments. Side-casters were first used in the United States to dredge the small inlets in the Outer Banks, NC and barrier islands along the Atlantic Coast and are effective in shallow channels where reintroduction of the dredged material into the channel is limited. During dredging operations, the vessel is operated at slow speeds and the dragarm and pumping operations are similar to those of the hopper dredge. The discharge pipe is positioned outboard, at right angels to the longitudinal centerline of the dredge. The dredged material slurry is discharged through the pipe back into the water alongside the channel (USACE, 1993).

Dustpan dredges are designed to work in rapid shoaling rivers, which carry a large volume of waterborne traffic and, in the United States, are used exclusively on the Mississippi River system. They are self-propelled, can move rapidly over long distances, and have a high production. However, dustpan dredges are only suitable for loose materials; they cannot tolerate wave action, and are not well suited for situations where disposal areas are distanced from dredging areas. While dredging, the dredge is anchored with two hauling anchors. The triangular shaped dustpan head is lowered with the open suction mouth located along the base parallel to the water jet manifold located at the suction mouth. High-pressure water is pumped through the manifold and a row of water jets dislodges the bottom material just forward of the suction mouth. The dredged material slurry is swept into the suction mouth of the dustpan and carried up the suction pipe, into the dredge pump, through the pipeline, and out the discharge end of the pipe.

3.03 Mechanical Dredges.

Mechanical dredges are characterized by the use of some form of bucket to excavate and raise the bottom material. They remove material by scooping it from the bottom and then placing it onto a waiting barge or directly into a disposal area. Mechanical dredges work best in consolidated, or hard-packed, materials and can be used to clear rocks and debris. Dredging buckets have difficulty retaining loose, fine materials, which can be washed from the bucket as it is raised. Special buckets have been designed for controlling the flow of water and material from buckets and are used when dredging contaminated sediments. Mechanical dredges are rugged and can work in tightly confined areas. They are mounted on a large barge and are towed to the dredging site and secured in place by anchors or spuds. They are often used in harbors, around docks and piers, and in relatively protected channels, but are not suited for areas of high traffic or rough seas.

Dipper dredges and clamshell dredges, named for the scooping buckets they employ, are the two most common types. A bucket dredge begins the digging operation by dropping the bucket in an open position from a point above the sediment. The bucket falls through the water and penetrates into the bottom material. The sides of the bucket are then closed and material is sheared from the bottom and contained in the bucket compartment. The bucket is raised above the water surface, swung to a point over the barge, and then released into the barge by opening the sides of the bucket. Usually two or more disposal barges, called dump scows, are used in conjunction with the mechanical dredge. While one barge is being filled, another is being towed to the dumpsite by a tug and emptied. If a diked disposal area is used, the material must be unloaded using mechanical or hydraulic equipment. Using numerous barges, work can proceed continuously, only interrupted by changing dump scows or moving the dredge. This makes mechanical dredges particularly well suited for dredging projects where the disposal site is many miles away. The dipper dredge is essentially a power shovel mounted on a barge. It can dig hard materials and has all the advantages of the bucket dredge, except for its deep digging and sea state capabilities. Similar to the bucket dredge operation, the dipper dredge places material into a barge, which is towed to a disposal area (USACE, 1993).

4.00 BEACH PLACEMENT ACTIVITIES

4.01 Past and Present Actions.

The history of beach placement activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions (See section 2.00 and Table 1) performed by local, State, and Federal entities. Future beach placement actions addressed through this assessment may include maintenance of these existing projects or activities on beaches that have not experienced a history of beach placement. According to Florida Department of Environmental Protection (Clark 1993), there are 825 miles of beach along the coast of Florida. Of the 35 coastal counties all but Jefferson have either eroding or critically eroding beach and most have both (Florida Department of Environmental Protection 2006). There are Corps shore protection projects along 155 miles in 18 counties. However, any of the 394 miles of critically eroded[1] or 100 miles of non-critically eroding shoreline could become the subject of a Corps civil works project or subject to a Corps regulatory permit action. There are also a number of deep draft and shallow draft navigation projects, the dredging of which might result in placement of sand on the beach or in the near-shore (Table 1). See Appendix 2 and part 5.00 on existing conditions for additional details.

[1] Florida Department of Environmental Protection defines "critically eroded" as "…erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost."

Table 1: Beach Placement Activities, Coast of Florida

County *	Beach Length (miles)	Critically Eroded (miles)	Non-Critically Eroded (miles)	Corps Shore Protection Project (miles)	Corps Shore Protection Study ***	Navigation Placement or Sand Bypass	Potential Other Navigation Placement	Groins, Breakwater, or Revetment	Regulatory Permit (non-corps project)
Nassau	12.7	10.0	0	7.7	yes	yes			
Duval	15.0	11.1	2	5.7		yes		yes	
St. Johns	41.1	7.8	0.5	2.5	yes	yes			
Flagler	18.1	5.4	0		yes				
Volusia	48.8	22.7	1.1	5	yes	yes			
Brevard	71.6	36.5	12.3	19.2	yes	yes			yes
Indian River	22.4	15.7	0		yes				yes
St. Lucie	21.5	9.4	7.9	2.3	yes	yes		yes	
Martin	21.4	18.0	0	3.75	yes	yes			yes
Palm Beach	45.3	31.8	0.9	15.5		yes			yes
Broward	24.0	21.3	0	17.1	yes	yes			yes
Dade	20.8	17	1.7	11.8	yes	yes		yes	yes
Monroe	52.5	10.2	1.6	0.1					yes
Collier	34.1	14.1	5.2			yes		yes	yes
Lee	47.3	21.3	5.4	12		yes	yes	yes	yes
Charlotte	12.2	5.2	0.4			yes			yes
Sarasota	34.7	22.6	0.4	4.42		yes	yes	yes	
Manatee	12.3	12.3	0	7.5		yes			
Hillsborough	2.1	1.6	0	4	yes	yes	yes		
Pinellas	37.2	21.9	4.4	11.6	yes	yes	yes	yes	
Pasco	4.4	0.2	1.1						yes
Hernando	0.8	0	0.5						
Citrus	0.2	0.2	0						
Levy	3.2	0.7	1.2						
Dixie	0	0.6	0						
Taylor	0.3	0.2	0						
Wakulla	3.0	1.3	0.4			yes			
Franklin	54.6	11.8	19.7			yes			
Gulf	28.8	6.6	10.3			yes			
Bay	41.2	20.8	10.1	17		yes			
Walton	25.6	14.3	0						Yes
Okaloosa	23.9	7.3	1.7						
Santa Rosa	5.0	4.1	0						Yes
Escambia	38.9	9.8	11.2	8.1		yes			
TOTAL	825	393.8	100	155.27	**	**	**	**	**

* Data source for shoreline data (eroded and critically eroded shoreline and inlet): *Critically Eroded Beaches in Florida* Updated April 2006. and for total beach (excludes inlets) *Technical and Design Memorandum 89-1*, 5th Edition, December 1993. both Florida Department of Environmental Protection

** See Appendices 2 and 7(a) for detailed breakdown on Corps' shore protection and navigation projects and regulatory permit actions. Any eroding or critically eroding shoreline may be subject to sand placement or other measures. Most beach renourishment projects have a renourishment interval of 3 to 7 years. Corps of Engineers participation in shore protection would depend on a net national economic development benefit (primarily storm damage reduction), public access to the beach, a willing and capable non-federal sponsor, and authorization and funding by Congress. Navigation placement would depend on the suitability of the dredged material, how the cost compares to other disposal options, and whether a non-federal entity is willing to pay any cost difference.

*** Ongoing or future study to add or modify a shore protection project.

4.02 Beach Placement of Sediment - Construction Operations.

For hydraulic pipeline and hopper dredge operations that include the placement of dredged material on the beach, a pipeline route is extended from the dredge plant to the beach placement location. Prior to the commencement of dredging, shore pipe is mobilized to the beach in segments of varying sizes in length and diameter. The mobilization process usually requires the use of heavy equipment to transport and connect pipe segments from the beach access point to the designated placement area. The placement of shore pipe is generally on the upper beach, away from existing dune vegetation, and just seaward of the toe of the primary dune. The width of disturbance area required to construct the pipeline route varies depending on the size of pipe used for the project. Site context and environmental features are considered for each project so that construction activities are confined to areas with minimal impact to the environment. Once the heavy equipment and pipe is on the beach and the pipes are connected, heavy equipment operation is generally confined to the vicinity of the mean high water line, away from dune vegetation on the upper beach. However, within the active disposal area, heavy equipment is operating throughout the width of the beach in order to manage the outflow of sediment and construct target elevations for the appropriate beach profile. The following sections describe this process, from mobilization to demobilization, in more detail.

4.02.1 Pre-Project Coordination.

Prior to bid opening for a beach placement project, the USACE identifies acceptable options for beach access of pipeline, pipe staging areas, and location of pipeline route. These identified locations are a result of extensive coordination with the Town, State and Federal resource agencies, and other stakeholders to identify public concerns relative to real estate easements, permit requirements, environmentally sensitive areas, etc. Contractor bids will incorporate these pre-coordinated and pre-identified sites; thus, prior to project commencement, the location of all equipment and operations is coordinated appropriately and approved by the Corps.

4.02.2 Mobilization.

Approximately 200 linear foot (or greater) pipe segments are floated or trucked in to the pre-identified staging area on the project site. Floated pipe is pressurized and moved using a tug and barge. Various pipe diameters (12", 16", 18", 20", 30", etc) are used depending on the size of the project and the dredge performing the work. Smaller diameter pipe are often made of High Density Polyethylene (HDPE) whereas; larger diameter pipe is made of steel. The ability to maneuver (i.e. bend) pipeline alignments is dependent on the size and makeup of the pipe. HDPE pipe is more agile than steal pipe. Dredging production rates decrease as the number of curves and bends in pipeline increase.

4.02.3 Staging Area.

The pre-identified and coordinated staging area is often within the vicinity of the access point and may contain a majority of the materials needed for the construction and maintenance of the project such as dozers (D7-D9), loaders, cranes, vehicles, pickup trucks, dump shack, etc. Additional equipment may include fuel tanks, generators, light plant, supply container sheds, bathrooms, etc.

In addition to the staging of equipment, the staging area is a work area for welders and grinders to prepare the pipe segments for connection. Though most pipe preparation occurs during daylight hours, depending on the project schedule and urgency, pipe preparation may or may not occur at night. If nighttime operations occur, lighting will be associated with these activities and must meet Corps and OSHA standards (See Section 4.02.5 (a)). The staging area is roped off for safety considerations throughout the life of the project.

4.02.4 Pipeline Preparation and Connection.

Depending on the type of pipe used for the project, pipeline preparation may entail cutting, grinding, and welding of pipe. For large projects, pipe is moved from the staging area to the pre-identified pipeline route using a wagon pulled by a piece of heavy equipment. Depending on the length of each pipe segment used for a given project, the pipe will be unloaded in piles at secondary staging areas along the designated pipeline route. These piles of pipe are temporary and in some cases are immediately assembled.

Pipe segments in the water extending from the dredge to the beach access point are typically attached using a ball and joint connecting system. From the beach access point to the pipe outflow end, the pipeline may consist of both “straight-line” pipe and “telescope” pipe. “Straight-line” pipe extends from the beach access to the point on the beach where the construction template is to be achieved. Depending on the material, length, and type of each section of pipe, the straight-line pipe may be bolted with a gasket, welded, or fused together using a fusing machine. The smooth connection points in “straight-line” pipe allow for a smooth flow of material through the pipeline; thus, maximizing production rates. Approximately every 200’ at the connection point for two pipe segments a small hole may be dug to allow the contractor to connect the pipe 360 degrees around. Once the “straight-line” pipeline is connected and the terminal point of the line is at the pipe outflow end, a y-valve joint will be added and “telescope” pipe is then connected. Pipe segments are placed one inside the other to generate the “telescope” pipeline and cedar planks and burlap are used for leak control. These types of connections have a reduced diameter and; therefore, production rates decrease do to the restricted flow of material. The y-valve and connecting “telescope” pipeline enables the contractor to “walk” the pipeline down the beach as the project is underway and reduce the amount of down time for extending pipe. While material is being placed on the beach and the construction template is achieved, the Contractor can extend the “telescope” pipe at the other end of the y-valve and switch the lines without having to shut down production to extend the pipeline. As a large portion of beach is constructed, additional “straight-line” pipe will be added to reduce the amount of “telescope” pipe used and to maintain acceptable levels of production.

4.02.5 Beach Construction.

The beach building process typically involves the use of bulldozers and sometimes backhoes to distribute the sediment as it falls out of suspension at the outflow end of the pipeline. The sediment slurry is defused as it is released from the terminal pipe in order reduce the flow velocity onto the beach. Dikes are constructed on one or two sides of the effluent area to allow for extended settlement time of suspended solids in order to reduce turbidity levels in the nearshore environment. The construction zone, which includes the active disposal area and associated heavy equipment used to redistribute sediment, generally encompasses a fenced off area of 500’ on each side. The Contractor places stakes to mark station locations and elevational requirements for the project template. As sediments fall out of suspension, dozers and backhoes are used to distribute sediment and construct the desired beach template. As target elevations for a given project and station are achieved, the designated construction area moves down the beach to the next station. Upon completion of a given section (generally 500 foot acceptance sections), stakes are removed from the beach. Throughout the duration of the pumping process, the Contractor is required to inspect the pipeline route (approximately every 2 hours) in order to check and fix pipe leaks. During all aspects of the construction operation, vehicles and heavy equipment including pickup trucks, all terrain vehicles (ATV's), bulldozers, etc. may traverse the beach; however, no driving or construction activity is allowed within existing dune vegetation or other environmentally sensitive locations identified prior to construction.

In addition to the heavy equipment and other small vehicles located within the active construction area at the disposal area, the contractor is also required to have a "Dump Shack," dumpster for trash disposal (a solid waste disposal management plan is required from the Contractor), and bathroom facility (port-o-john). The Contractor may also have an equipment supply container that follows the progression of the disposal area.

(a) Lighting During Construction.

According to the 2003 US Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1), a luminance range of 3-30 lm/ft^2 is required for general outdoor work or construction areas. In order to meet these safety standards, appropriate lighting must be provided at night during specific components of the project site (i.e. disposal site, dredge, staging area, etc.). Most of the equipment staging, mobilization, and demobilization of pipeline are performed during daylight hours. However, nighttime work does occur if there is a small construction window and the work schedule is tight. For projects where lighting is a concern for sensitive organisms, ample lighting can be obtained without impacting a large area by using light shields and appropriate angling of lights. In addition to staged light in the construction area, the vehicles used for transport as well as the bulldozers moving sediment will have lights on the front and back of the equipment. Features within the active disposal area including the "dump shack," equipment storage, etc. may also have lighting associated with them.

(b) Lighting from Nearby Dredge.

Dredge plants and associated tugs and barges are required to meet Corps, US Coast Guard, and OSHA lighting standards for safety. During the dredging process, if the dredge is within the vicinity of the beach (i.e. within the inlet complex) lighting from the dredge or other associated vessels may impact sensitive beach organisms (i.e. sea turtles). Furthermore, on hopper dredges, ample lighting is specifically required for the observers on board to provide safe access at night to the inflow boxes and screens. In addition to dredging within channels, inlets, etc. some dredging may be land based (i.e. dredging of disposal islands (See Section 2.03). During these unique dredging projects, additional lighting impacts may occur on the disposal island from the dredge and associated heavy equipment working on the site to move anchors, etc.

(c) Tilling.

Depending on the compatibility of sediment placed on the beach and the post-project compaction levels, the Contractor may be required to till the constructed beach. The process of tilling entails pulling a series of tines through the sediment using a tractor or other piece of heavy equipment in order to prevent or alleviate post project beach compaction. The tilling device is designed to penetrate approximately 24-36 inches, relative to species specific sea turtle nest depths; however, depths can vary given site specific circumstances (See sections 2.11). Tilling is often performed after the target beach template is achieved and the project section has been accepted by the USACE Contracting Officer. Tilling is often performed (i.e. overlapping rows, parallel and perpendicular rows, etc.) so that all portions of the beach are tilled and no furrows are left behind and must be completed prior to May 1. If the project is completed during the nesting season, all tiling operations are coordinated with the appropriate sea turtle beach monitoring representatives. Tilling is not performed in areas where nests have been left in place or relocated (See Section 7.02.7 (e)(5)). After a given section of beach is tilled, the Contractor will drag a piece of fencing or other similar type object to smooth any ridges on the beach surface. This process may be done concurrently with the tilling operation or as a separate event.

4.02.6 Demobilization.

Demobilization is essentially the reverse of the mobilization process (See Section 4.02.2) and includes the breakdown of all "straight-line" and "telescope" pipe, the staging of pipe segments in the staging area, and the removal of all equipment from the staging area. The staging area for the demobilization process is similar to the mobilization process and functions like a large production line. As the pipe is broken down, pieces of pipe are transported and stacked using trucks, wagons, cranes, etc. and prepared for transport off-site via barges, trucks, or tugs.

4.03 Beach Placement of Sediment – Associated Hard Structure Features (Seawalls, Groins, Breakwaters, Sills, etc.)

On highly developed shorelines with significant beach erosion problems, hard structure alternatives may be used as a beach stabilization structure, in combination with beach fill activities, in order to retard erosion and increase the amount of time sediment remains on the beach. Such hard structure measures may consist of seawalls, revetments, groins, bulkheads, and breakwaters. Seawalls, revetments, and bulkheads are used to protect inland development and to armor the shoreline against erosion; whereas, groins, nearshore breakwaters, and sills are beach stabilization structures designed to increase the longevity of a beach fill. Beach stabilization structures alone do not provide the sand to maintain a wide protective or recreational beach. Accretion in one area, as a result of shore-perpendicular structures, is balanced by erosion elsewhere unless additional sand is introduced into the project area. Due to the effects of hard structures on adjacent beaches, site conditions and context must be considered during placement. The design of successful beach stabilization structures involves applying knowledge of the physical environment and coastal processes at a site to the selection of a type of structure, the preliminary design of the structure(s), and the subsequent analysis and refinement of the design (USACE, 1989). Beach stabilization features may be built of various materials such as rubble mound construction, sheet-pile construction (timber, concrete, or steel), gabions, sand bags, geo-tubes, etc. and for shore perpendicular structures, may be permeable or impermeable. Permeable groin features have openings or voids large enough to permit passage of appreciable quantities of littoral drift through the structure;

whereas, impermeable groin features are constructed such that sand cannot pass through the structure (but sand may still move over or around it).

(1) Seawalls, revetments, and bulkheads.

These structures are built parallel to the shore to protect the area immediately behind them, but afford no protection to adjacent areas or beach in front of them and can modify coastal processes such as longshore and cross-shore transport rates and prevent the normal functioning of the beach environment.

(2) Groins.

Groins are barrier-type structures that extend from the backshore into the littoral zone and may be constructed either as a single feature or in series along the length of beach to be protected, referred to as a groin field or system. The purpose of groins is to modify the longshore movement of sand to either accumulate sand on the shore or impede sand losses. Current FDEP policy is to only allow the construction of groins, in association with a beach restoration project, to minimize sand loss in a "critical erosion" area. Depending on specific site conditions including, wave climate, littoral drift, offshore profiles, erosional hot spots, etc., groins have varying applications and may be used, if necessary, in combination with beach fill to provide better shore protection features by anchoring the fill material and by modifying longshore sand transport.

(a) Types of Groins.

Groins have been constructed, depending on the site context and conditions, in various configurations, which are classified as high or low, long or short, permeable or impermeable, and fixed or adjustable. The length of the groin will determine the rate of sediment passage around the end of the structures, whereas the design height will determine the rate of sediment passage over the structure. Groin length should be established based on the expected surf zone width with the shoreline at its desired post-construction location. Groins that initially extend beyond this point will impound more sand than desired, and erosion will extend further down coast. Short groins that do not extend across the entire surf zone will not intercept all of the longshore transport and some sand may bypass the groins outer end; thus, reducing erosion of down-drift beaches. Selection of a groin's height is based on several factors which will minimize the use of construction materials, control sand movement over the top of the groin, control wave reflections, and control the amount of sheltering from waves the groin provides to down-drift beaches. The groin profile generally consists of: (1) a high landward end with a horizontal crest at about the elevation of the existing or desired beach berm, (2) a seaward sloping section that connects the high landward end with an outer or seaward section at about the slope of the beach face, and a seaward section generally with a lower elevation. A lower elevation allows for waves to carry some sediment over the structure and will reduce wave reflections from the groin. Groin permeability will also contribute to the amount of sediment moving down-drift of the structure and depending on the site conditions, sediment budget, longshore drift, etc., the desired amount of down-drift sediment movement can be controlled by the degree of groin void spacing. Usually, sheet pile groins are impermeable while rubble mound groins have some degree of permeability depending on the level of sand tightening (USACE, 1992).

Depending on site context, cost, and availability, a wide variety of materials are used in the construction of groins including stone, sheet pile, sand bags, geo-tubes, etc. Groin structures are used at various locations throughout the Atlantic and Gulf coasts of Florida as either stand alone shoreline protection features or in combination with beach fill projects. Though most groins are constructed as straight shore-perpendicular features, composite groins have shore parallel segments added to a straight groin, called the stem. Groins with composite plan shapes such as a spur, inclined, angular, Z-shape, L-shape, and T-head groins are constructed to achieve a more stable dynamic-equilibrium beach plan shape and are considered more efficient than straight groins in holding the shoreline position. Composite groins reduce rip currents, provide wave shelter, reduce wave steepness, and induce significant diffraction and refraction (Hanson and Kraus, 2001). Each groin shape functions differently depending on the specific site conditions. The shore parallel segments shelter the leeward beach, promoting accumulation of sediment as waves tend to transform from erosional to accretionary with approach to the groin stem and a salient or tombolo is formed(USACE, 1992).

For beach nourishment / restoration projects where the project area tapers or ends at an inlet, a “terminal groin” may be constructed to contain sand within the project area or to control the rate at which sand is lost from the project area by longshore transport. In order to reduce sand losses from the beach project and to prevent sediment from infilling the inlet, structures are sand tight, impermeable, high, and long in order to prevent sand from being carried through, over, or around them. Furthermore, the design of terminal groins is often angled, specific for the site conditions. For beach projects that taper or end within an adjacent beach, a transition reach is often needed to taper into the un-stabilized beach. The length of the groins at the end of the project is gradually decreased to form a transition from the project’s typical groins to the adjacent beach (USACE, 1992).

(3) Nearshore Breakwaters.

Nearshore breakwaters can be either shore-connected or detached and may be built singly or in a series spaced along the shoreline. Crest elevation determines the amount of energy transmitted over the top of a nearshore breakwater or submerged sill. High crest elevations preclude overtopping by all but the highest waves whereas low crest elevations allow frequent overtopping. The four basic forms of nearshore breakwaters for shore stabilization are a single detached breakwater, a multiple detached breakwater system, artificial headlands, and a submerged sill structure intended to form a perched beach. The effectiveness of a nearshore breakwater depends on the environmental conditions in which it is constructed. Detached breakwaters are constructed close to the shore to protect a stretch of shoreline from low to moderate wave action and to reduce severe wave action and beach erosion. Littoral material is carried behind the breakwater where it is deposited in the lower waver energy region. Protection from breakwaters will reduce erosion during significant storm events and promote accretion during periods of low wave activity. Nearshore breakwaters can also be constructed to create artificial headlands (USACE, 1992).

Depending on the design characteristics (length, height, nearness to shore, etc.), three different types of shorelines can develop behind a breakwater or system of breakwaters: (1) Tombolo formation (the resultant breakwater / tombolo formation functions like a T-groin), (2) a bulged shoreline (“salient”) landward of the structure, and (3) limited shoreline sinuosity or “salient” formation due to limited sediment supply.

(a) Sills.

Shore parallel sills can be utilized in combination with beach fill in order to reduce the rate of offshore sand movement. Though sills provide some wave protection to the beach behind it, the sheltering effect is smaller considering the low sill crest. The primary function of submerged sills is to act as a barrier to shore-normal sediment motion rather than the reduction of wave action, as provided by breakwaters. The height of the sill's crest and it's alongshore continuity differentiates submerged sills from nearshore breakwaters (USACE, 1992).

5.00 EXISTING CONDITIONS

Since 1950, Florida's population has grown from 2.7 million to nearly 13 million, of which, 75% live within ten miles of the coast (FCMP, 1996). The Southwest Florida coastal population has seen its population grow almost 15-fold since 1950, from 63,000 to 1 million residents (FCMP, 1998). Broward, Miami-Dade, and Palm Beach counties are among the ten leading counties in absolute population growth in the United States between 1994 and 2015 (National Oceanographic and Atmospheric Administration (NOAA), 1998). Coastal development throughout the state of Florida continues to rise, and by 2010 Florida's coastal population is expected to grow by 35%. As more money is invested along the coastline, the issue of property protection from the ocean continues to gain interest. Pressures generated by coastal development have led to disruptions of natural processes and have threatened the ecological and economic values of the coastal zone.

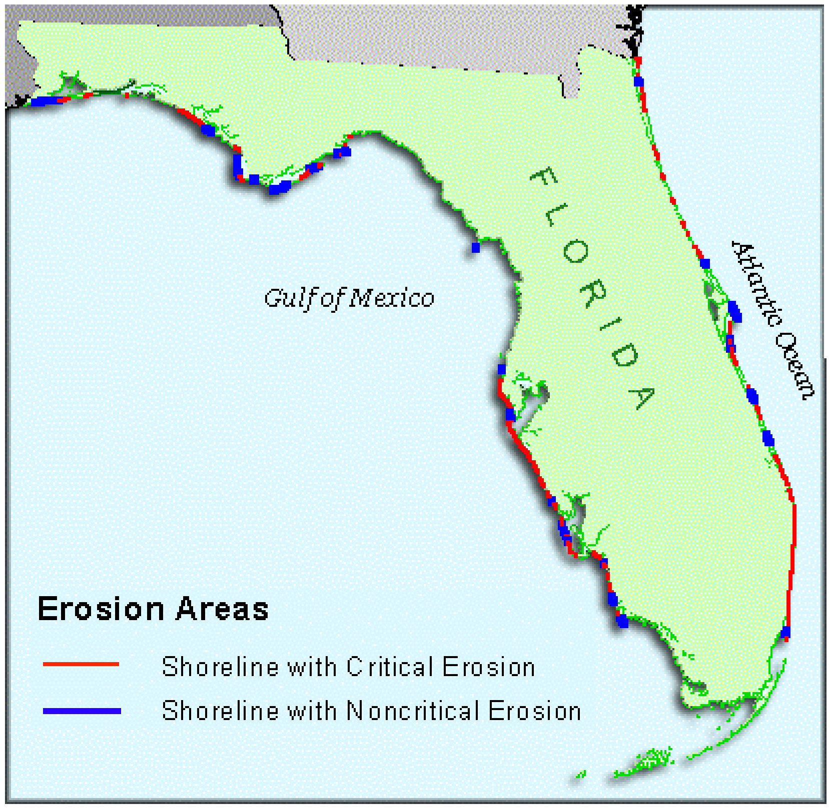
The economy of many coastal states is not driven by the local population, but by tourism, which contributes $260 billion to the U.S. economy and $60 billion in federal taxes (King, 1999). In Florida, beach tourism generates about $15 billion a year to the state's economy (FCMP, 1996). As much as 62 percent or $158 billion of Florida's entire Gross State Product is generated in coastal areas (NOAA, 1998). The economic stronghold of tourism on beach communities necessitates the need for attractive, large and pristine beaches to attract the tourist dollar. The beach, however, is an extremely dynamic environment, constantly eroding and accreting sediment over time. Beach erosion results in coastal land loss due to current transport of sediment (alongshore, cross-shore), wind erosion from the berm, and relative sea level rise (Finkl, 1996). With increased development, continued severe beach erosion, and an increase in the number of hurricanes, large-scale efforts are required in order to prevent or slow down this natural process of shoreline retreat. Inlet construction and related channel protection activities are one of the leading causes of beach erosion in Florida (FCMP, 1996). Erosion around inlets is being reduced through the use of inlet management plans in coordination with the Florida Department of Environmental Protection's (DEP's) Bureau of Beaches and Coastal Systems. By placing sand from maintenance dredging on or near an eroding beach, some of the erosion loss can be reduced. Florida is also a primary target for hurricanes resulting in significant erosion events. From 1900 to 1994, 36% of all U.S. hurricanes hit Florida and 71% of category 4 or higher hurricanes have hit either Florida or Texas (Hebert et. al., 1995). In 2004, four hurricanes (Ivan, Charley, Jeanne, and Frances) made landfall throughout the coast of Florida, two on the Atlantic coast (Jeanne and Francis) and two (Ivan and Charley) on the Gulf coast, resulting in significant damage and shoreline erosion throughout the State. As a result of the hurricane damage, in 2005 Federal funding towards Florida's shore protection program increased from $7 million in 2004 to about $210 million in 2005. Approximately 83.4 miles of shoreline was restored consisting of approximately 18.5 million cubic yards of sand placed on the beach. Furthermore, The 2005 hurricane season was a record breaking season with 27 named storms, of which, Florida was impacted by seven (Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma and Tropical Storms Arlene and Tammy). The impact of these storms exacerbated erosion conditions in south and northwest Florida.

Over 435 miles of the Florida's 825 miles (Atlantic – 389.1; Gulf – 435.9) of sandy beaches have experienced erosion. As identified in the 2006 report, "Critically Eroded Beaches in Florida," the Department of Environmental Protection's Bureau of Beaches and Coastal Systems has defined 385.3 miles of sandy beaches as critically eroded, 8.6 miles of critically eroded inlet shoreline, 96.8 miles of non-critically eroded beach, and 3.2 miles of non-critically eroded inlet shoreline (http://www.dep.state.fl.us/beaches/programs/coasteng.htm.) (Figure 3). According to the Bureau, "critical erosion" is defined as:

"a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects."

Since 1964, the Florida Legislature has appropriated nearly $200 million for beach preservation and erosion control with matching funds provided by local government and federal dollars (FCMP, 1998). Depending on the shoreline protection measure utilized, the potential for habitat degradation may exist. However, for beach communities throughout the Atlantic and Gulf coasts of Florida, erosion rates are so severe that beachfront habitat is almost entirely lost and; therefore, restoration of habitat through beach management practices is becoming critical.

Figure 3. Erosion areas throughout the Atlantic and Gulf coasts of Florida (http://www.dep.state.fl.us/beaches/programs/coasteng.htm).



6.00 SPECIES CONSIDERED UNDER THIS ASSESSMENT

Updated lists of endangered and threatened (E&T) species for the project area were obtained from the USFWS (Florida Field Offices) (http://fl-es.fws.gov/). This list contains E&T species that could be present in the proposed project area based upon their geographic range. However, the actual occurrence of a species in the area would depend upon the availability of suitable habitat, the season of the year relative to a species' temperature tolerance and migratory habits, and other factors.

Table 2. Threatened and Endangered Species Potentially Present Along the Atlantic and Gulf Coasts of Florida.

Species Common Names	Scientific Name	Federal Status
Mammals		
West Indian Manatee	*Trichechus manatus*	Endangered
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered
Birds		
Roseate Tern	*Sterna dougallii dougallii*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Piping Plover	*Charadrius melodus*	Threatened
Snowy Plover	*Charadrius alexandrinus*	Status Review
Red Knot	*Calidris canutus rufa*	Candidate Species
Reptiles		
Green sea turtle	*Chelonia mydas*	Threatened[1]
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Vascular Plants		
Beach jacquemontia	*Jacquemontia reclinata*	Endangered
Deltoid spurge	*Chamaesyce deltoidea ssp. deltoidea*	Threatened
Status	Definition	
Endangered	A taxon "in danger of extinction throughout all or a significant portion of its range."	
Threatened	A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."	

[1]Green turtles are listed as threatened, except for breeding populations in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

7.00 IMPACTS TO LISTED THREATENED AND ENDANGERED SPECIES

7.01 General Impacts.

Dredging operations and the subsequent placement of sediment on the beach have the potential to adversely affect animals and plants in a variety of ways. These include actions of the dredging equipment (i.e., cutting, suction, sediment removal, hydraulic pumping of water and sediment); physical contact with dredging equipment and vessels (i.e. impact); physical barriers imposed by the presence of dredging equipment (i.e. pipelines); and placement of dredged material in various locations (i.e. covering, compaction, escarpment formation, etc.). Potential impacts vary according to the type of equipment used, the nature and location of sediment discharged, the time period in relation to life cycles of organisms that could be affected, and the nature of the interaction of a particular species with the dredging activities.

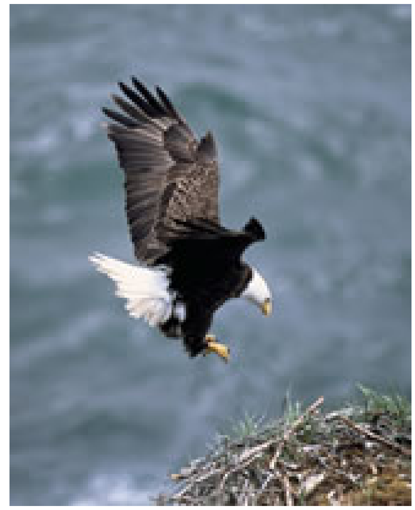
All the proposed activities (See Section 2.00) will occur along the Atlantic and Gulf coast beaches of Florida. The specific beach placement actions covered by this assessment will all have varying design templates and purposes, including various alternatives for berm width, dune considerations, fill lengths, etc. Any potential impacts on Federally listed threatened and endangered species would be limited to those species that occur in habitats provided by the project areas. Therefore, the proposed work will not affect any listed species, which generally reside in freshwater, forested habitats, adjacent marshes, etc.

Federally listed threatened or endangered species, which could be present in the project area during the proposed action, are identified in Table 2.

Dredging and disposal methods associated with the proposed action are similar to current maintenance dredging methods and existing beach nourishment projects (Table 1). These methods have been addressed in a number of previous environmental documents, including biological assessments and biological opinions rendered regarding endangered and threatened species.

7.02 Species Accounts.

7.02.1 Bald Eagles



a. Status. Endangered

b. Background.

The bald eagle (*Haliaeetus leucocephalus*) is a Federally listed threatened species and is therefore, currently protected under the Endangered Species Act (ESA). However, the best available scientific and commercial data available indicates that the bald eagle has recovered with a population increase in the lower 48 states from approximately 487 active nests in 1963, to an estimated minimum 7,066 breeding pairs today. In Florida, the population has tripled since 1982. Therefore, on July 6, 1999 (64 FR 36453) the Service originally proposed delisting the bald eagle and on February 16, 2006 re-opened the public comment period to remove the bald eagle from the Federal list of threatened and endangered species. If delisting under the ESA is found to be warranted, additional legal protections for Bald eagles include the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). If the bald eagle is delisted, the BGEPA will become the primary law protecting bald eagles (Federal Register / Vol. 71, No. 32, February 16, 2006, 50 CFR Part 17, RIN 1018-AF21). The 1940 BGEPA (16 U.S.C. 668-668c), as amended, prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The Act defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. In anticipation of possible delisting of the bald eagle, on February 16, 2006 the Service proposed a definition of “disturb” under the BGEPA to guide post-delisting bald eagle management. Under the BGEPA, the Service defines “disturb” as: “To agitate or bother a bald or golden eagle to the degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, causing injury, death, or nest abandonment (Federal Register / Vol. 71, No. 32, February 16, 2006, 50 CFR Part 22, RIN 1018-AT94).”

The MBTA (16 U.S.C. 703-712), as amended, prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define “take” under the MBTA as “pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect (USFWS, 1987).”

Bald eagles can be found throughout all of the conterminous United States and Alaska. Their breeding range in North America is often associated with aquatic habitats (coastal areas, rivers, lakes, and reservoirs) with forested shorelines or cliffs. Bald eagles are considered common in South Florida and are known to breed throughout the state, with a limited distribution in the panhandle. Currently in South Florida, bald eagle nesting is prevalent along the southwest Gulf Coast and the Kissimmee River valley including Polk and Osceola counties (Curnutt, 1996).

Bald eagles are opportunistic foragers and their diet varies across the range based on prey species available; however, in South Florida the bulk of the diet is fish. Nesting habitat includes a nest tree, perch, and roost sites and nest sites in Florida are usually located in the ecotone between forest and marsh or open water (less than 200 m from open water). In extreme southern Florida, nest sites are located principally near the coast, within 50 m of open water and nests are typically located in mangrove snags (http://www.fws.gov/verobeach/species/birds/baea-msrp/baea-msrp.html).

c. Project Impacts.

All construction activities associated with the beach placement of sediment will be confined to the beach environment, seaward of adjacent opportune nesting sites (See Section 4.02). Though direct impacts from construction activities will not occur, potential nesting sites within the vicinity of the dredging activities or pipeline routes may be indirectly impacted. In 1987, under the bald eagle recovery plan, the Service identified habitat management guidelines for the Southeast Region in order to avoid any potential impacts to nesting bald eagles (USFWS, 1987). Nesbitt *et al.* (1993) evaluated the effectiveness of the guidelines in protecting bald eagle habitat and found that eagle use and productivity was not significantly affected by human encroachment when the guidelines were implemented and adhered to. Pending a potential delisting of the bald eagle from the Federal ESA, the Service published "Draft National Bald Eagle Management Guidelines" (dated February 2006) in order to promote the continued conservation of the bald eagle following its removal from the Federal List of endangered and threatened wildlife and plants and to avoid future degradation or destruction of bald eagle nesting, roosting, and foraging areas from human activities (http://www.fws.gov/northflorida/BaldEagles/2006-FWS-bald-eagle-clearance-ltr.htm). These guidelines are intended to:

(1) Publicize the provisions of the BGEPA that continue to protect bald eagles, in order to reduce the possibility that people will violate the law.
(2) Advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles.
(3) Encourage land management practices that benefit bald eagles and their habitat.

For the purposes of this assessment, though delisting of the bald eagle is still under review and the release of the National Bald Eagle Management Guidelines is still in draft form, the Corps will implement the most current recommended draft guidelines provided by the Service until a final document is published, upon which, the final guidelines will be adhered to.

d. Effect Determination.

Considering that the construction operations associated with the placement of sediment on the Atlantic and Gulf coast beaches of Florida will (1) not directly impact the nesting habitat of bald eagles and (2) that indirect impacts from construction activities will be avoided or minimized through the implementation of USFWS "Draft National Bald Eagle Management Guidelines (February 2006)," it has been determined that the proposed action may affect but is not likely to adversely affect bald eagles.

7.02.2 Roseate Tern.

a. Status. Threatened

b. Background.

The roseate tern population in Florida is small, has a limited range, and in recent years has experienced poor nest success. Therefore, on 2 November 1987, the roseate tern was Federally listed as threatened throughout the entire Caribbean population. The Caribbean population of the roseate tern breeds from Florida through the West Indies to islands off Central America and northern South America; however, no critical habitat currently exists. During the 1970s, a loss of nesting sites, competition from other colonial nesters, and predation contributed to a significant population decline and subsequent listing in 1987 for both the northeastern and Caribbean populations. Recent surveys of the Florida population have identified only three nesting colonies containing an estimated 300 pairs (http://www.fws.gov/northflorida/Species-Accounts/SpeciesInfo.htm).

Breeding populations for the North American subspecies of roseate terns are divided into two separate populations, one in the northeastern U.S. and Nova Scotia, and one in the southeastern U.S. and Caribbean. Wintering sites are concentrated along the north and northeastern coasts of South America. The Roseate Tern is strictly a coastal species in Florida, breeding in parts of the Florida Keys during the summer and migrating throughout the South Florida coast during the spring and fall. They are colonial nesters, often associating with other terns. Open sandy beaches isolated from human activity and predators are optimal nesting habitat for the roseate tern. They often nest on bare sand with scant vegetation laying eggs around mid-May with hatch outs occurring around mid-June through early July. The four major nesting colony sites in Florida are Pelican Shoal, Vaca Rock, Truman Annex, and the Marathon Governmental Center. However, some nesting may occur on dredged material disposal islands and gravel rooftops. The Roseate Tern is often observed plunge-diving in the nearshore surf foraging on small fish. When feeding chicks, they have been observed flying up to 20 km from the colony returning with a single fish (Nisbet, 1989).

The current recovery strategy for Roseate Terns in South Florida is to maintain or increase the estimated 300 breeding pairs by protecting, restoring, and managing the existing colony sites, provide additional colony sites, and to initiate conservation programs to maintain, protect, and enhance productivity of colony sites. Protection of known colony sites should entail posting, regular patrolling during the breeding season, limited recreational use, and techniques for predator control.

c. Project Impacts.

The South Florida breeding population of Roseate Terns is experiencing both direct and indirect impacts (predation, storms, tidal inundation, flooding, habitat alteration, habitat destruction, etc.) that may affect adult birds, nests, eggs, young, and the ability for adults to produce a large clutch or feed their young. The placement of sediment and the associated beach construction activities could impact nesting, foraging, and migrating Roseate Terns. However, placement of compatible material on beaches may also restore eroded nesting habitat and potentially provide additional colony sites; thus, fulfilling a component of the Roseate Tern recovery strategy.

Considering that the current nesting areas in Florida are the only place in the US where Roseate Terns from the Caribbean population breed, beach placement activities will avoid breeding and nesting activities, including the four major identified nesting colony sites in South Florida (Pelican Shoal, Vaca Rock, Truman Annex, and the Marathon Governmental Center, from May through July. All beach placement activities that can not adhere to this breeding and nesting window will be addressed through separate coordination and amendments to this document.

Increased turbidity in the nearshore environment is often associated with the beach construction process, depending on the characteristics of the material, and may affect foraging activities of Roseate Terns. As the sediment slurry is released from the outflow pipe, courser sediments fall out while finer sediment remains in suspension and are carried into the nearshore water column. Turbidity is managed during the construction operation by building a dike around the outflow area allowing for more time for sediment to fall out prior to reaching the nearshore environment. The resultant increase in turbidity of the nearshore environment is generally short-term, isolated, and is no more significant than increased turbidity episodes associated with large-scale storm events. Though increased turbidity may impact foraging capabilities of the Roseate Tern and subsequent feeding of chicks, long range foraging (20 km) (Nisbet, 1989) has been documented and it is likely that foraging outside of turbid areas would occur. Furthermore, beach construction activities will likely occur during periods when Roseate Terns are migrating along the South Florida coast during the spring and fall. Roosting and foraging activities may be impacted within the construction site; however, these areas are site specific and adjacent area outside of the active construction zones would be available.

d. Effect Determination.

Considering that the placement of sediment and associated construction activities will (1) avoid identified major nesting colony sites and avoid breeding and nesting time frames and (2) associated turbidity impacts to foraging are short-term and site specific, it is likely that beach construction activities may affect but are not likely to adversely affect Roseate Terns.

7.02.3 Piping Plover.

a. Status. Threatened

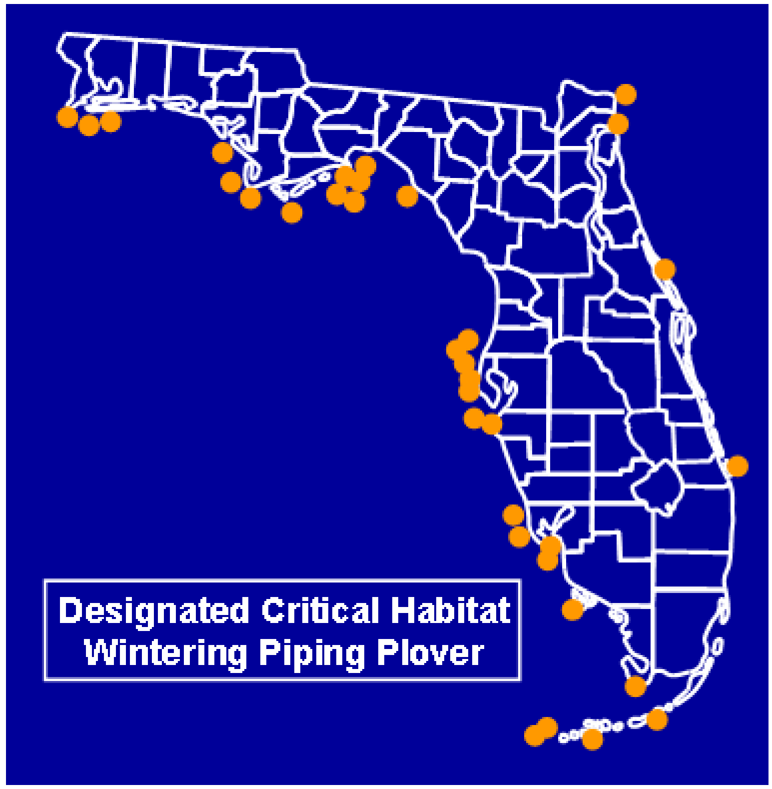
b. Background.

The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast (from North Carolina south), the Gulf Coast, and in the Caribbean where they spend a majority of their time foraging. Since being listed as threatened in 1986, only 800 pairs were known to exist in the three major populations combined and by 1995 the number of detected breeding pairs increased to 1,350. This population increase can most likely be attributed to increased survey efforts and implementation of recovery plans.

Piping plovers typically nest in sand depressions on un-vegetated portions of the beach above the high tide line on sand flats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and washover areas cut into or between dunes. They head to their breeding grounds in late March or early April and nesting usually begins in late April; however, nests have been found as late as July (Potter, *et al*., 1980). Feeding areas include intertidal portions of ocean beaches, washover areas, mud flats, sand flats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes (USFWS, 1996). Prey consist of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates (Bent, 1928).

Loss and degradation of habitat due to development and shoreline stabilization have been major contributors to the decline of piping plovers in Florida. The current commercial, residential, and recreational development has decreased the amount of coastal habitat available for piping plovers to nest, roost, and feed. Furthermore, beach erosion and the abundance of predators, including wild and domestic animals as well as feral cats, have further diminished the potential for successful nesting of this species. Since project beaches are wintering area for the piping plover, the major threat to its occupation of the area during the winter months would be continued degradation of beach foraging habitat.

c. Critical Habitat for Wintering Piping Plover Designation.



Critical habitat receives protection under Section 7 of the Endangered Species Act through the prohibition against destruction or adverse modification of critical habitat with regard to actions carried out, funded, or authorized by a Federal agency. Section 7 requires consultation on Federal actions that are likely to result in the destruction or adverse modification of critical habitat.

The piping plover is a fairly common winter resident along the Atlantic and Gulf Coasts of Florida where they spend a majority of their time foraging. When not foraging, plovers can be found roosting, preening, bathing, in aggressive encounters, and moving among available habitat locations (Zonick and Ryan, 1996). On 10 July 2001, the USFWS designated 137 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas as critical habitat for the wintering population of the piping plover where they spend up to 10 months of each year on the wintering grounds. Piping plovers begin arriving on the wintering grounds in July, with some late-nesting birds arriving in September. A few individuals can be found in the wintering grounds throughout the year, but sightings are rare in late May, June, and early July. Constituent elements for the piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these primary constituent elements within the designated boundaries are considered critical habitat. The primary constituent elements are found in coastal areas that support intertidal beaches and flats (mud flats, sand flats, algal flats, and washover passes) and associated dune systems and flats above annual high tide. Important components of intertidal flats include sand and/or mudflats with no or very sparse emergent vegetation. Adjacent non-or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers. Important components of the beach/dune ecosystem include surf cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Designated critical habitat does not include existing developed sites consisting of buildings, marinas, paved areas, boat ramps, exposed oil and gas pipelines, and similar structures (Federal Register/Vol. 66, No 132, July 10, 2001).

The USFWS has defined textual unit descriptions to designate areas within the critical habitat boundary (Appendix 3). These units describe the geography of the area using reference points, include the areas from the landward boundaries to the MLLW, and may describe other areas within the unit that are utilized by the piping plover and contain the primary constituent elements (Federal Register/Vol. 66, No 132, July 10, 2001).

d. Project Impacts.

(1) Habitat.

A majority of the existing shoreline throughout the state of Florida is heavily developed and is experiencing significant shoreline erosion from both anthropogenic and natural causes. Habitat loss from coastal development, long-shore and cross-shore shoreline erosion, shoreline erosion impacts from hard structure protection measures (i.e. jetties, groins, etc.) (See Section 4.03), and heavy public use has led to the degradation of piping plover habitat throughout the State. As erosion and development persist throughout the coast of Florida, piping plover roosting and foraging habitat loss continues. The enhancement of beach habitat through the addition of beach fill, in highly erosive environments, may potentially restore lost roosting and beach front intertidal foraging habitat. Short-term impacts to foraging (1-3 years) and roosting (during construction) habitat may occur as a result of beach placement activities and associated construction operations. However, long-term foraging habitat loss may occur if existing or potential washover habitat and intertidal habitat are lost due to shoreline protection measures (i.e. dunes, groins, jetties, etc.) that prevent the formation of washover fans during large storm events or impede longshore transport, resulting in down-drift erosion.

Cross-island transport of sediment and subsequent washover fan formation is considered a primary constituent element used in defining piping plover critical habitat. These low lying sand flats contain sparse vegetation and offer optimum habitat for piping plovers. Though eroded roosting habitat my be restored with the placement of beach fill, an increase in the width and height of the constructed berm, as well as the potential incorporation of a protective dune, hard structure, etc., may function as a barrier to cross island transport of sediment during significant erosion events resulting in long-term washover foraging habitat loss.

In order to minimize long-term impacts to existing washover habitat or potential washover fan formation, beach placement activities will avoid impacts to the primary constituent elements of piping plover critical habitat to the maximum extent practicable. Pre-project surveys will be performed to assess the presence of and/or potential for washover fan formation as well as its overall habitat value relative to the surrounding conditions. These identified high value habitat features will be considered during project design. The Corps will work with the appropriate resource agencies to develop shore protection design features with minimal impact to piping plover constituent elements. The goal of this working group will be to develop shore protection design guidelines that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (i.e. washover fans). Furthermore, in the event that avoidance or innovative design features can not be implemented, innovative mitigation measures will be developed to enhance or restore lost habitat.

The formation of sand bars and emergent sand spit islands within inlet complexes serve as valuable habitat for piping plovers and other shorebird species. In many cases these sites contain the important mosaic of habitat types including algal flats, sand flats, mud flats, etc. Though these formations are highly dynamic, they are often protected and isolated from human development pressures and associated disturbances; thus, they offer valuable roosting and foraging habitat. The size and frequency of occurrence is dependent on the sediment budget within an individual inlet complex and the interval period for inlet bypassing of sediment. Inlet bypassing of accreted sediments within inlet complexes is intended to mitigate down-drift erosion, and subsequent habitat loss, resulting from the interruption of longshore transport of sediments from hard structures and deep navigation channels. However, the resultant habitat from the bypassing of sediment on down-drift beaches is, in some cases, dependent on the removal of sediment accretion within the inlet. Though the bypassing of sediment to down-drift beaches may help mitigate lost intertidal foraging grounds, the isolation and protection offered by emergent sand spit and/or sand bar features within inlets is a critical, limited, and high value habitat feature for piping plovers and other shorebirds.

Most inlets throughout the state of Florida have an active inlet management plan, utilizing maintenance dredging to provide safe navigation and to mitigate the erosion of adjacent beaches through inlet bypassing/backpassing mechanisms. However, management of down-drift erosion through inlet bypassing/backpassing could result in the loss of emergent spit and sand bar formation. Therefore, the presence and absence of these valuable sand flat features are dependent on the frequency in which these dredging and bypassing/backpassing events occur. In recognition of these valuable habitat features as well as the balance between the need for dredging to maintain safe channels and mitigate associated erosional features, the USACE will work with the State of Florida DEP to consider the value and context of habitat features within each inlets management plan. These significant inlet habitat features throughout the state, particularly the Panhandle and on the southwest coast where piping plovers concentrate during migration and wintering, will be considered and evaluated in order to adjust future dredging frequencies, to the maximum extent practicable, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex.

The placement of sediment along Atlantic and Gulf coast beaches of Florida will adhere to appropriate windows to the maximum extent practicable. Since piping plovers do not nest in Florida, construction activities will not impact breeding and nesting piping plovers. Direct short-term foraging habitat losses may occur during the placement of sediment on the beach and associated construction operations. Since only a small portion of the foraging habitat is directly affected at any point in time during pump out and adjacent habitat is still available, overall direct loss of foraging habitat will be minimal and short-term.

(2) Critical Habitat.

All construction activities will avoid, to the maximum extent practicable, USFWS designated critical habitat areas. In the event that construction activities can not avoid areas of designated critical wintering habitat, the primary constituent elements for the biological needs of roosting, sheltering, and foraging may be impacted. In order to minimize impacts to the primary constituent elements, survey guidelines for non-breeding shorebirds will be implemented as outlined in Appendix 4. Furthermore, pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting. Based on historical literature and surveys, any site identified by the USFWS as unique and high quality piping plover habitat will require additional consultation from this assessment in order to implement site specific habitat protection measures.

(3) Food Supply.

Piping plovers feed along beaches and intertidal mud and sand flats. Primary prey includes polychaete worms, crustaceans, insects, and bivalves. The placement of sediment on the beach may have negative short-term impacts on surf zone intertidal macrofauna through direct burial, increased turbidity in the surf zone, or changes in the sand grain size or beach profile. The placement of sediment on the beach would be expected to move along the beach at a relatively slow rate (i.e., about a mile per month or about 200 feet per day) and only a portion of the beach is affected at any point in time. This rate of progress is slow enough that foraging piping plovers may move to other areas that are not affected by the nourishment operation. As the dredging operation passes by a given section of beach, that area is soon available for re-colonization by invertebrates. Therefore, un-impacted or recovering foraging habitat within a project site will be available throughout the duration of the project.

Literature dating back to the early 1970's along the southeast coast indicate that opportunistic infauna species (ex. *Emerita*, *Donax, Haustorius spp., etc.*) found in the nourished areas are subject to direct mortality from burial, however, recovery often occurs within 1-3 years, (Hayden and Dolan, 1974; Saloman, 1984; Van Dolah *et al*., 1992; Van Dolah *et al*., 1993; Jutte, P.C. *et al*., 1999) especially if compatible material is placed on the beach (Hayden and Dolan, 1974; Reilly and Bellis, 1978; Saloman, 1984; Nelson, 1989; Van Dolah *et al*., 1992; Van Dolah *et al*., 1993; Hackney *et al*., 1996; Jutte, P.C. *et al*., 1999; Peterson *et al*., 2000). A literature review of polychaete annelid species affected by beach placement activities, performed by Hackney *et. al.* (1996), indicates that sediment disturbance has a strong negative effect on tube-building and sedentary polychaetes; however, minimal effects and, in some cases, enhancing effects of some mobile taxa. Some studies indicate that following beach placement activities, a population shift may occur as an enhanced abundance of some polychaete species occurs within disturbed areas (Coastal Science Associates, 2003; Lindquist and Manning, 2001; Peterson and Manning, 2002).

Temporary impacts on intertidal macrofauna in the immediate vicinity of the beach nourishment project are expected as a result of discharges of material on the beach. Any reduction in the numbers and/or biomass of intertidal macrofauna present immediately after beach nourishment may have localized limiting effects on foraging piping plovers due to a reduced food supply or shift in species abundance and diversity. In such instances, these birds may be temporarily displaced to other locations.

The use of shore parallel or shore perpendicular hard structure for shoreline protection may result in more long-term loss of intertidal foraging habitat as long-shore transport of sediment is impeded and intertidal habitat becomes subtidal. However, for shoreline protection projects, hard structures are mostly used in combination with beach fill in order to minimize the risk of down drift erosion and subsequent intertidal foraging habitat loss.

e. Effect Determination.

The placement of sediment on the beach and the associated construction activities may temporarily impact foraging, sheltering, and roosting habitat and may impact the constituent elements for piping plover wintering habitat. Furthermore, the construction of shore protection features (i.e. dunes, groins, etc.) in combination with beach fill may result in more long term impacts to the availability of washover habitat. Shore perpendicular structures that impede the long-shore transport of sediment may impact down-drift intertidal foraging habitat. Bypassing/backpassing inlet accreted sediment to adjacent beaches, as a mitigative component of inlet management, results in the short-term loss of valuable piping plover habitat provided by emergent spit and sand bar formations. Considering the potential impacts of these actions, it has been determined that the placement of sediment may affect the piping plover.

7.02.4 Snowy Plover.

a. Status. State – Threatened; Federal - Under Review

b. Background.

Breeding populations of the snowy plover can be found throughout the Gulf coast of Florida where suitable habitat exists with a majority located in the Panhandle. With the increase in coastal development, continued coastal erosion, and subsequent habitat degradation, numbers and distribution have steadily decreased in the past 30 years. Therefore, the Snowy Plover is listed as a threatened species by the state and is under review by the Federal government (Wood, 1991).

Snowy plover nesting records along the Gulf coast range from March through September; with a portion of the Panhandle population over wintering in Northwest Florida. On the Gulf coast breeding occurs from Pensacola to Marco Island and is absent from the Big Bend portion of the Gulf coast due to the lack of available nesting habitat. In central and southern Florida, breeding occurs only in a few protected parks, such as Caladesi Island, Fort DeSoto Park, and Cayo Costa and on isolated peninsulas (Howell, 1932). Snowy Plovers require open dry sand near dunes for breeding with access to inner dunes for brood protection. Open areas within the inner dunes support re-nesting opportunities after losses due to storms or other disturbance. Nests consist of a shallow open scrape on flat areas near the frontal dune and within sight of the water so hatchling chicks have access by foot to the foraging grounds. They are often associated with small objects and can be found within the vicinity of least tern nesting colonies.

Snowy Plovers feed on terrestrial and aquatic invertebrates including beetles, flies, small mollusks, and seeds (Howell, 1932). Particularly on the Gulf Coast, they feed on small crustaceans, mollusks, marine worms, aquatic insects, and seeds along Gulf beaches and flats.

c. Project Impacts.

(1) Habitat.

A majority of the existing shoreline throughout the Gulf coast of Florida is heavily developed and is experiencing significant shoreline erosion. As beachfront habitat continues to be developed into residential and recreational areas, habitat loss (roosting, foraging, breeding, and nesting) and degradation throughout the coast will persist. As a result of habitat loss to private development, a majority of the nesting populations exist in protected parks. The enhancement of beach habitat through the addition of beach fill may potentially restore lost habitat on heavily developed and severely eroding lands; however, direct short-term foraging and roosting habitat losses may occur during the placement of sediment on the beach and associated construction operations. Since only a small portion of the foraging and roosting habitat is directly affected at any point in time during pump out, and adjacent habitat is still available, overall direct loss of foraging and roosting habitat will be minimal and short-term for non-breeding birds. However, due to the physiological and behavioral requirements of nesting adults and the inability for hatchling chicks to access adjacent un-impacted habitats, foraging impacts to nesting adults and chicks may be more significant (See Section 7.02.4 (c)(2)). Furthermore, nesting habitat requirements for snowy plovers include open sandy areas within the inner dunes and within site of water so hatchling chicks have access by foot to the intertidal foraging grounds. Shore protection projects that include a dune feature should consider these habitat requirements during project design. Dune features should be constructed and planted to minimize impacts to existing breeding grounds by maintaining and enhancing existing nesting habitat features as well as creating nesting habitat in areas that did not previously support nesting snowy plovers.

As identified in Section 7.02.3 D (1), (1) the formation of washover fans during large storm events and (2) the formation of sand bars and emergent sand spit islands within inlet complexes serve as valuable habitat for snowy plovers and other shorebirds. Specific measures to minimize impacts of dredging and beach placement of sediment on these habitat types as discussed in Section 7.02.3 D (1) will be implemented for snowy plovers.

In order to avoid impacts to breeding snowy plovers and hatchlings, the placement of sediment along Gulf coast beaches of Florida will adhere to appropriate breeding windows, from March through September, to the maximum extent practicable. However, for severely eroding beaches that warrant shore protection actions, habitat requirements for breeding and nesting will likely already be lost or degraded. Therefore, the enhancement of beach habitat through beach placement activities may potentially restore lost breeding and nesting habitat. If the breeding season can not be avoided the USACE will work with the resource agencies in order to develop a sufficient monitoring plan in order to avoid construction impacts to snowy plover hatchlings. For beach placement actions that can not avoid the breeding and nesting window, surveys will be implemented prior to any construction activity in order to document when hatching occurs and closely monitor hatchling movements during construction in order to avoid impacts from equipment.

(2) Food Supply.

Snowy Plovers feed on small crustaceans, mollusks, marine worms, aquatic insects, and seeds along Gulf beaches and flats. The placement of sediment on the beach may have negative short-term impacts on surf zone intertidal macrofauna through direct burial, increased turbidity in the surf zone, or changes in the sand grain size or beach profile. Literature dating back to the early 1970's along the southeast coast indicate that opportunistic infauna species (ex. *Emerita* and *Donax*) found in the nourished areas are subject to direct mortality from burial, however, recovery often occurs within 1-3 years especially if compatible material is placed on the beach (See Section 7.02.3 (d)(3)). Considering the relatively slow rate of movement during beach construction operations, availability of adjacent un-impacted foraging grounds, and rapid re-colonization rates in impacted areas, foraging habitat for non-breeding snowy plovers will still be available throughout the duration of the project. However, considering the physiological and behavioral requirement s (i.e. incubation, brood rearing, etc.) of nesting birds, moving to un-impacted foraging grounds is not possible for both nesting adults and hatchlings. Hatchling snowy plovers can not fly and feed themselves by walking from the nest to nearby foraging habitat about 1-2 days after hatch out. If nesting occurs before or during project construction, adult and hatchling snowy plovers will most likely experience lowered food supply and thus affect reproductive success. Furthermore, considering that snowy plover chicks feed themselves upon hatch out and traverse back and forth to the foraging grounds by foot, escarpment formations that result during the post-beach fill equilibration process could act as a physical barrier to the chicks; thus, exposing them to predators and vehicles.

e. Effect Determination.

If all beach placement activities occur outside of the breeding and nesting window and associated dune features do not degrade habitat requirements for breeding and nesting snowy plovers, impacts to foraging, sheltering, roosting, breeding, and nesting habitat will be short-term; thus, the placement of sediment may affect but is not likely to adversely affect the snowy plover. If beach placement activities can not avoid the breeding and nesting window and occur within a snowy plover breeding area, the placement of sediment may adversely affect the snowy plover. In order to minimize direct impacts to the nesting habitat as well as nesting adults and hatchling chicks, a monitoring protocol will be developed and implemented by the USACE and appropriate resource agencies to monitor snowy plover chicks upon hatch out in order to prevent being run over by construction equipment. Furthermore, in order to minimize impediments to and from the intertidal foraging grounds, nesting habitat requirements will be considered during dune design, planting, and construction and escarpments will be leveled prior to the breeding season in order to avoid impacts to chicks.

7.02.5 Red Knot.

a.) Status. Federal – Candidate Species

b .) Background.

The red knot (*Calidris canutus rufa)* is a medium-sized shorebird that undertakes an annual 30,000 km hemispheric migration, one of the longest among shorebirds. Their migration route extends from overwintering sites in the southernmost tip of South America at Tierra del Fuego, up the Eastern coast of the Americas through the Delaware Bay, and ultimately to breeding sites in the central Canadian Arctic. Red knots break their migration into strategically timed and selected non-stop segments, of approximately 1,500 miles, throughout the entire Atlantic coast. These staging areas consist of highly productive foraging locations which are repeatedly used year to year. As the red knot moves towards the northern extent of its migration route, the timing of departures becomes increasingly synchronized. One critical foraging stop for red knots occurs in the Delaware Bay where they feed almost exclusively on horseshoe crab eggs, due to their high fat content and ease of digestion, in order to reach threshold departure masses (180-200 g) prior to heading for the Arctic breeding grounds. The arrival of the red knot in the Delaware Bay coincides with the spawning of the horseshoe crabs, which peaks in May and June. Birds arrive emaciated and can nearly double their mass (~4.6 grams/day) prior to departure if foraging conditions are favorable (Baker *et. al*., 2001), eating an estimated 18,000 fat-rich horseshoe crab eggs per day (Andres *et al*. 2003). This critical foraging stop over enables knots to achieve the nutrient store levels necessary for migration, survival, and maximizing the reproductive potential of the population (Baker *et. al*., 2004). In order to increase their body mass at such a rapid rate during their refueling stopover in the Delaware Bay, red knots morph their guts during their migration route from South America to Delaware. However, a population that comes up the Atlantic coast with a Florida stopover during their yearly migration does not morph their gut and are capable of processing muscle spat and/or donax for refueling (Harrington, Pers. Comm.). According to Harrington *et. al*. (1998), knots that stage at Delaware Bay in the spring come mostly from South America; whereas, knots that winter in Florida are underrepresented during migration in New Jersey and Massachusetts. Considering that no evidence of exchange exists between Argentina and Florida marked birds, this study suggests that wintering populations are discrete.

The location and density of the Florida wintering population is provided in Appendix 5. Species utilization of these sites has been documented through shorebird surveys dating back to 1977, with significant concentrations located between Dunedin and Naples. During the winter, the red knot frequents intertidal habitats, notably along ocean coasts and large bays. Considering that the Florida wintering red knots do not morph their guts, they are capable of foraging predominantly on coquina clams (*Donax variabilis*) along these intertidal habitats. However, knots also utilize algae covered sand or mud flats within back barrier sounds, sheltered bays, or lagoons presumably feeding on bubble shells (Harrington, pers. Comm.). Red knots are not site specific in the foraging requirements but rather move frequently following the patchy distribution of coquina clams and, considering this mobility, are tolerant of limited disturbance. Unlike the mobile foraging behavior of red knots, roosting knots require wide open stretches of beach with limited human disturbance. Roosting knots are more temperamental than foraging knots and are less tolerant of disturbance. Beaches that have roosting habitat features but maintain consistent human activity will not be utilized by roosting red knots without sufficient management to prevent disturbance.

Studies by Baker *et. al.* (2004), Morrison *et. al*. (2004), Niles *et. al*. (2005), and others have documented the dramatic decline in the population of the *rufa* subspecies of the red knot. Baker *et al*. (2004) found that from 1997-2002 an increasing proportion of red knots failed to reach the threshold departure mass of 180-220 g, suggesting that, if red knot populations continue to decline at their present rate, the bird could go extinct by or near 2010. New research by Niles *et. al.* (2005) confirms that this extinction trajectory remains on track.

Over the past 10 years, heavy commercial harvest of horseshoe crabs has caused a rapid decline in the crab's breeding population in Delaware Bay, reducing the number of eggs available to shorebirds. During this time the red knot population has declined from over 90,000 birds counted on Delaware Bay in 1989, to 32,000 in 2002. Similar declines have been shown in the South American wintering grounds suggesting that the viability of the red knot is seriously threatened. Demographic modeling predicts imminent endangerment and an increased risk of extinction without urgent management (Baker *et. al*., 2004).

Morrison *et al*. (2004) have identified four factors that cause this vulnerability: (1) a tendency to concentrate in a limited number of locations during migration and on the wintering grounds, so that deleterious changes can affect a large proportion of the population at once; (2) a limited reproductive output, subject to vagaries of weather and predator cycles in the Arctic, which in conjunction with long lifespan suggests slow recovery from population declines; (3) a migration schedule closely timed to seasonally abundant food resources, such as horseshoe crab (*Limulus polyphemus*) eggs during spring migration in Delaware Bay, suggesting that there may be limited flexibility in migration routes or schedules; (4) occupation and use of coastal wetland habitats that are affected by a wide variety of human activities and developments.

Considering the threat of extinction, petitions have been submitted to the United States Fish and Wildlife Service (USFWS) for emergency listing of the *rufa* subspecies of the Red Knot (*Calidris canutus rufa*) as endangered and to designate "critical habitat" under the Endangered Species Act ("ESA"). On 12 September 2006, the USFWS included the red knot as a candidate species that may warrant protection under the Endangered Species Act (ESA). The USFWS is currently reviewing the status of the red knot for potential listing but it is precluded by species with a higher listing priority. Although the candidate species status does not provide any regulatory protection under ESA, the USFWS recommends that, given its candidate status, all federal agencies funding, authorizing, or conducting actions that may affect the red knot or its habitat, including impacts to prey resources, give full consideration to the species in project planning.

c.) Project Impacts.

The placement of sediment on the beach may have short-term impacts on benthic invertebrates. However, recovery occurs within 1-3 years depending on sediment compatibility and the frequency and size of disturbance (See Section 7.02.3 (d)(3)). Given their mobile foraging patterns, local disruptions to foraging habitat are likely not that disruptive to red knots (Harrington, pers. Comm..). Therefore, disruption from construction activities associated with beach placement of sediment will likely result in the movement of knots to an alternative foraging location. However, multiple or large scale disruptions effecting all key foraging locations at one time could have a profound impact. Though knots can relocate with localized disruption, large scale disturbances that impact the entire range of foraging locations may be significant. Within the limits of foraging distribution, beach placement activities should be constructed in a manner as to allow for un-impacted foraging habitat locations and avoid large scale disruption to benthic invertebrates to the maximum extent practicable.

Roosting knots prefer wide stretches of beach with limited disturbance. Contrary to their ability to tolerate disturbance while foraging and move among foraging habitats, knots will avoid or abandon available roosting habitat adjacent to areas of disturbance. Furthermore, large scale development and continued beach erosion within their Florida wintering range has limited the availability of habitat that contains the necessary features for a suitable roosting environment. Beach placement actions that occur within these limited roosting locations should avoid roosting timeframes or implement appropriate buffer requirements (See Appendix 4) during construction to the maximum extent practicable in order to minimize impacts. Considering that roosting habitat in Florida has become increasingly degraded or lost due to erosion and development, beach placement of sediment may have a beneficial effect on the red knot's roosting habitat. Roosting habitat for red knots requires space between structure and waters edge where people walk. By expanding the width of the beach, roosting habitat will be made available as long as the area is offered protection from chronic human disturbance (Harrington, pers. Comm.).

d.) Effect Determination.

Considering that construction activities will; (1) avoid large scale disturbance within the limits of red knot foraging distribution and allow for areas of un-impacted or recovered foraging habitat within a given year, and; (2) avoid roosting timeframes or provide appropriate buffers around existing roosting habitat during construction operations, the placement of sediment on the beach may affect but will not likely adversely effect the red knot. Any beach placement action that is unable to adhere to the measures identified in this assessment to avoid impacts to the red knot and its wintering habitat requirements may necessitate additional consultation.

7.02.6 West Indian Manatee

a. Status. Endangered.

b. Background.

The West Indian manatee (*Trichechus manatus*), also known as the Florida manatee, is a Federally-listed endangered aquatic mammal protected under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), the Marine Mammal Protection Act of 1972, as amended (16 U.S.C 1461 et seq.), and the Florida Manatee Sanctuary Act of 1978, as amended. Manatees inhabit both salt and fresh water and can be found in shallow (5 ft to usually <20 ft), slow-moving rivers, estuaries, saltwater bays, canals, and coastal areas (USFWS, 1991) throughout their range. On occasion, manatees have been observed as much as 3.7 miles off the Florida Gulf coast. The West Indian manatee is herbivorous and eats aquatic plants such as hydrilla, eelgrass, and water lettuce.

During the cooler months between October and April, Florida manatees concentrate in areas of warmer water. Manatees are thermally stressed at water temperatures below 18ºC (64.4ºF) (Garrott *et al*., 1995); therefore, during winter months, when ambient water temperatures approach 20ºC (68ºF), the U.S. manatee population confines itself to the coastal waters of the southern half of peninsular Florida and to springs and warm water industrial outfalls as far north as southeast Georgia. Manatees also winter in the St. Johns River near Blue Spring State Park. Severe cold fronts have been known to kill manatees when the animals did not have access to warm water refuges. During summer months, they may migrate as far north as coastal Virginia on the east coast and the Louisiana coast on the Gulf of Mexico and appear to choose areas based on an adequate food supply, water depth, and proximity to fresh water (USFWS, 1983). Annual migratory circuits of some individuals through the intracoastal waterway of the Atlantic Coast are 1,700 km round trips at seasonal travel rates as high as 50 km/day (Reid *et al*., 1991)

Manatee population trends are poorly understood, but deaths have increased steadily. The population of manatees in Florida has been estimated to be at least 1,865 individuals. In the last decade, yearly mortality in Florida has averaged nearly 150 animals a year (USFWS, 1983). A large percent of mortality is due to collisions with watercrafts, especially of calves. Another closely related factor in their decline has been the loss of suitable habitat through incompatible coastal development, particularly destruction of sea grass beds by boating facilities (USFWS, 2001).

c. Critical Habitat.

The following areas in Florida (exclusive of those existing manmade structures or settlements which are not necessary to the normal needs or survival of the species) are critical habitat for the manatee: Crystal River and its headwaters known as King's Bay, Citrus County; the Little Manatee River downstream from the U.S. Highway 301 bridge, Hillsborough County, the Little Manatee River downstream from the Lake Manatee Dam, Manatee County; the Myakka River downstream from Myakka River State Park, Sarasota and Charlotte Counties; the Peace River downstream from the Florida State Highway 760 bridge, DeSoto and Charlotte Counties; and Charlotte Harbor north of the Charlotte-Lee County line, Charlotte County; Caloosahatchee River downstream from the Florida State Highway 31 bridge, Lee County; all United States territorial waters adjoining the coast and islands of Lee County; all United States territorial waters adjoining the coast and islands and all connected bays, estuaries, and rivers from Gordon's Pass near Naples, Collier County, southward to and including Whitewater Bay, Monroe County; all waters of Card, Barnes, Blackwater, Little Blackwater, Manatee, and Buttonwood Sounds between Key Largo, Monroe County; and the mainland of Dade County; Biscayne Bay, and all adjoining and connected lakes, rivers, canals, waterways from the southern tip of Key Biscayne northward to and including Maule Lake, Dade County; all of Lake Worth, from its northernmost point immediately south of the intersection of U.S. Highway 1 and Florida State Highway A1A southward to its southernmost point immediately north of the town of Boynton Beach, Palm Beach County; the Loxahatchee River and its headwaters, Martin and West Palm Beach Counties; that section of the intracoastal waterway from the town of Sewalls Point, Martin County, to Jupiter Inlet, Palm Beach County; the entire section of water known as the Indian River, from its northernmost point immediately south of the intersection of U.S. Highway 1, and Florida State Highway 3, Volusia County, southward to its southernmost point near the town of Sewalls Point, Martin County; the entire inland section of water known as the Banana river and all waterways between the Indian and Banana rivers, Brevard County; the St. Johns River including Lake George, and including Blue Springs and Silver Glen Springs from their points of origin to their confluences with the St. Johns River; that section of the Intracoastal Waterway from its confluence with the St. Marys River on the Georgia-Florida border to the Florida State Highway A1A bridge south of Coastal City, Nassau and Duval Counties (http://www.fws.gov/northflorida/Manatee/Documents/Critical-Habitat-Manatee.pdf).

d. Project Impacts.

(1) Habitat.

Direct effects on manatees from the dredging operation (See Section 3.0) and the placement of material on the beach (See Section 4.0) should be minor. However, site-specific conditions relating to habitat requirements such as sea grass beds, critical habitat designations, etc. should be addressed outside of this assessment. From 1974 through 1994, 2,456 manatee carcasses were recovered in the southeastern U.S. Eight hundred and two (33 percent) were attributed to human-related causes. Of these, 613 were caused by collisions with watercraft, 111 were flood gate/canal lock-related, and another 78 were categorized as other human-r elated (USFWS, 2000). In Florida, human related mortality accounted for the greatest proportion of deaths with identifiable causes (45 percent, with another 24 percent of deaths resulting from undetermined causes) from 1986-1992. Collisions with watercraft accounted for 83 percent of human-related causes of death during this period (Ackerman *et al*. 1994, Wright *et al*. 1994). Vessel traffic, including crew boats, tugs, barges, etc., will be a component of all dredging operations and; therefore, the potential for collision may exist. To insure that dredging does not affect manatees, the Corps has adopted the "Standard State and Federal Manatee Protection Conditions" as part of its standard operating procedures on all water related projects:

Manatee Protection Conditions:

1. The Contractor shall instruct all personnel associated with the project of the potential presence of manatees, the need to avoid collisions with these animals and the need to be on constant lookout for manatees during all phases of operation.

2. All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees and right whales which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act. The Contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.

3. If siltation barriers are used, they shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.

4. All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in waters where the draft of the vessel provides less than a four foot clearance from the bottom and vessels shall follow routes of deep water whenever possible. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category where navigational safety permits.

5. If a manatee(s) is sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. If a manatee is closer than 50 feet to moving equipment or the project area, the equipment shall be shut down and all construction activities shall cease to ensure protection of the manatee. Construction activities shall not resume until the manatee has departed the project area.

6. Prior to commencement of construction, each vessel involved in construction activities shall display at the vessel control station or in a prominent location, visible to all employees operating the vessel, a temporary sign at least 8 1/2" x 11" reading, "Caution: Manatee Habitat/Idle Speed is Required in Construction Area." In the absence of a vessel, a temporary 3' x 4' sign reading "Caution: Manatee Area" will be posted adjacent to the issued construction permit. A second temporary sign measuring 8½" X 11" reading "Caution: Manatee Habitat. Equipment Must Be Shutdown Immediately If A Manatee Comes Within 50 Feet Of Operation" will be posted at the dredge operator control station and at a location prominently adjacent to the displayed issued construction permit. The Contractor shall remove the placards upon completion of construction.

7. Any collisions with a manatee or sighting of any injured or incapacitated manatee shall be reported immediately to the Corps of Engineers. The order of contact within the Corps of Engineers shall be as follows:

Order of Contact of Corps Personnel for Dredging Contractor to Report Manatee Death or Injury

Title		*Telephone Numbers*	
		Work	*After Hours*
Corps, Inspector		*On Site*	*Lodging Location*
[Area][Resident] Engineer, [ ] (CESAJ-[ ]-[ ])		*TBP*	*TBP*
Chief, Environmental Branch Planning Division (CESAJ-PD-E)		904-232-3943	*TBP*
Chief, Construction Branch Construction-Operations Division (CESAJ-CO-C)		904-232-1639	*TBP*
Chief, Construction-Operations Division (CESAJ-CO)		904-232-1118	*TBP*

The Contractor shall also immediately report any take of a manatee to the Florida Marine Patrol "Manatee Hotline" 1-888-404-FWCC (3922) as well as the U.S. Fish and Wildlife Service, [Jacksonville Field Station at 904-232-2580 for North Florida] [Vero Beach Field Office at 772-562-3909 for South Florida]

8. The Contractor shall maintain a daily log detailing sightings, collisions, or injuries to manatees occurring during the contract period. The data shall be recorded on forms provided by the Contracting Officer (sample form is appended to the end of this section). All data in original form shall be forwarded directly to the Chief of Environmental Resources Branch, P. O. Box 4970, Jacksonville, Florida, 32232-0019, within 10 days of collection and copies of the data will be supplied to the Contracting Officer. Within 15 days, following project completion, a report summarizing the above incidents and sightings, including a list and addresses of all observers utilized during the construction will be submitted to the following:

Florida Fish and Wildlife Conservation Commission
Imperiled Species Management Division
620 South Meridian Street, Mail Stop 6A
Tallahassee, Florida 32399-1600

Chief, Environmental Branch
U.S. Army Corps of Engineers (CESAJ-PD-E)
P.O. Box 4970
Jacksonville, Florida 32232-0019

[Area][Resident] Engineer, [ ]
U.S. Army Corps of Engineers (CESAJ-[ ]-[ ]

[U.S. Fish and Wildlife Service
6620 Southpoint Drive South, Suite 310
Jacksonville, Florida 32216-0912]

[U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32961-3559]

Furthermore, during hopper dredge operations, National Marine Fisheries Service observers will be on board 24 hours a day and will serve as a lookout to alert the vessel pilot of the occurrence of manatees in the project areas. If a manatee is observed, collisions shall be avoided either through reduced vessel speed, course alteration, or both.

d. Effect Determination.

Considering that the “Manatee Protection Conditions” will be adhered to and NMFS approved observers will be on board all hopper dredge operations, the proposed actions may affect but are not likely to adversely affect the manatee or its critical habitat. Specific impacts to manatee critical habitat components and food supply as a result of dredging operations are not covered within this assessment and should be addressed by separate (project specific) consultation or as a subsequent amendment to the Regional Biological Opinion.

7.02.7 Beach Mice.

a. Status.

Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered

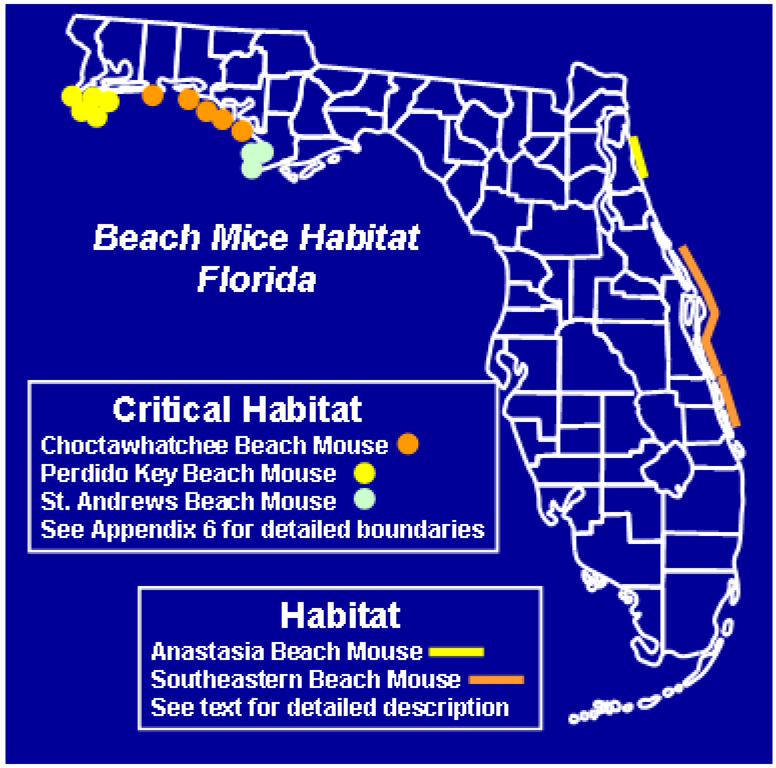
b. Background.

(1) Perdido Key, Choctawhatchee, and St. Andrews Beach Mice.

(a) Range.

The Perdido Key Beach mouse and Choctawhatchee beach mouse were listed as endangered on June 6, 1985 and the St. Andrew Beach mouse was listed as endangered on December 18, 1998. The Perdido Key beach mouse, Choctawhatchee beach mouse, and St. Andrew beach mouse are three of five subspecies of the old-field mouse that inhabit coastal dune communities along the Gulf coast of Florida and Alabama. Historic distributions of the Perdido Key beach mouse extended along the entire length of the island of Perdido Key, starting in Alabama at Florida Point and continuing eastward to the Pensacola Bay inlet. However, by 1986, due to habitat fragmentation, hurricane events, etc. the number of mice remaining was believed to be less than 30 animals. After several successful relocation episodes, the population now exists on public lands in areas along 8.4 miles of coastline on Perdido Key at Gulf Islands National Seashore and Perdido Key State Park. Choctawhatchee beach mice were once present along the coastal dunes between Choctawhatchee Bay and St. Andrew Bay, Florida. Four general areas of occupancy currently exist: (1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), (2) Shell Island (includes St. Andrew State Park mainland, Tyndall Air Force Base (AFB), and private land in holdings), (3) Grayton Beach State Park (and adjacent eastern private lands), and (4) West Crooked Island (Tyndall AFB) and adjacent private lands. The geographical range of St. Andrew beach mice is identified as St. Joseph spit in Gulf County, Florida, the east entrance of St. Andrew Bay, including Cape San Blas and Money Bayou in Bay County, Florida. The St. Andrew beach mouse currently consists of two core populations, East Crooked Island (Tyndall AFB) and adjacent private lands, and St. Joseph Peninsula State Park and adjacent private lands.

(b) Habitat.



The habitat is restricted to the mature coastal barrier sand dunes along the Gulf (USFWS, 1991). According to Meyers (1983), optimal beach mouse habitat should have: (1) high maximum elevation of coastal sand dunes; (2) relatively great differences between maximum dune height and minimum interdunal elevation; (3) close proximity of forest; (4) a sparse ground cover, and (5) relatively low cover of sea oats. Early research suggested that the frontal dune system was a significant habitat component utilized by the beach mice. However, new research suggests that scrub dune habitat serves an invaluable role in the persistence of the beach mouse population (Sneckenberger, 2001). Therefore, habitat components considered critical for beach mice extend from the frontal dune landward to the transition from scrub habitat to maritime forest. Within the rows of dunes paralleling the shoreline towards the scrub habitat are three microhabitats including the frontal dune (primary), interdunal areas (secondary), and inland dunes (scrub). The primary, secondary, and scrub dune habitat is utilized for burrow sites, food resources, cover, and high-elevation refuge from storm events (/Vol. 70, No. 240, December 15, 2005). The food plants most utilized by beach mice are beach grass and sea oats; however, they may eat invertebrates when seed sources are scarce in the late winter or early spring (USFWS, 1992).

Beach mice are burrow-inhabiting animals occupying either old burrow of ghost crabs or digging their own burrows. Burrows are located mainly on the lee side of the primary, secondary, and scrub dunes where vegetation provides suitable cover. As many as 20 burrows may be found within their home range, suggesting that they are semi-nomadic. Each burrow may be used for various purposes (refuge, nesting, food storage, etc.) at different periods of time. Beach mice are nocturnal, spending the day sleeping in their burrows and foraging at night.

(c) Critical Habitat.

Critical habitat receives protection under section 7 of the Endangered Species Act through the prohibition against destruction or adverse modification of critical habitat with regard to actions carried out, funded, or authorized by a Federal agency. Critical habitat determinations are based on the best scientific data available and consider those physical and biological features (primary constituent elements) that are essential to the conservation of the species, and that may require special management considerations and protection. Section 7 requires consultation on Federal actions that are likely to result in the destruction or adverse modification of critical habitat.

On 12 October 2006, the USFWS issued in the Federal Register the final rule for designation of critical habitat for the Perdido Key beach mouse, the Choctawhatchee beach mouse and the St. Andrew beach mouse pursuant to the Endangered Species Act of 1973, as amended. Critical habitat for the Perdido Key, Choctawhatchee, and St. Andrew beach mice includes habitat throughout the subspecies' ranges in Baldwin County, Alabama, and Escambia, Okaloosa, Walton, Bay, and Gulf Counties, Florida. The primary constituent elements of critical habitat for the Choctawhatchee, Perdido Key, and St. Andrews beach mice are the habitat components that provide: (1) a contiguous mosaic of primary, secondary, and scrub vegetation and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous non-native species present, that collectively provide foraging opportunities, cover, and burrow sites, (2) Primary and secondary dunes, generally dominated by sea oats, that, despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes, provide abundant food resources, burrow sites, and protection from predators, (3) scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane-induced storm surge, (4) functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements and re-colonization of locally extirpated areas, and (5) a natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth, and viability of all life stages.

Under the final rule, the USFWS has identified five units as critical habitat for the Perdido Key beach mouse, ((1) Gulf State Park Unit, (2) West Perdido Key Unit, (3) Perdido Key State Park Unit, (4) Gulf Beach Unit, and (5) Gulf Islands National Seashore Unit), five units for the Choctawhatchee beach mouse ((1) Henderson Beach Unit, (2) Topsail Hill Unit, (3) Grayton Beach Unit, (4) Deer Lake Unit, and (5) West Crooked Island/Shell Island Unit), and three units for the St. Andrew beach mouse ((1) East Crooked Island Unit, (2) Palm Point Unit, and (3) St. Joseph Peninsula Unit). A detailed description of each designated unit and maps of the location of each unit can be found in Appendix 6.

(2) Southeastern Beach Mouse and Anastasia Island Beach Mouse.

(a) Range.

The southeastern beach mouse and the Anastasia Island beach mouse were both Federally listed as threatened and endangered species respectively on 12 May, 1989. Historically, the southeastern beach mouse occurred along about 280 km of Florida's southeast coast, from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami Beach in Miami-Dade County, Florida (Stout, 1992). Based on the most recent published literature, the southeastern beach mouse is currently restricted to about 80 km of beach, occurring in Volusia County (Smyrna Dunes Park), Brevard County (Canaveral National Seashore, Merritt Island National Wildlife Refuge, and Cape Canaveral Air Force Station), and in scattered areas in Indian River (Sebastian Inlet State Recreation Area) and St. Lucie counties. The historic distribution of the Anastasia beach mouse was from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida. Currently, the species is limited to Anastasia Island, primarily at the north and south ends of the island.

(b) Habitat.

Based on the available literature, all subspecies of beach mice are similar in their habitat requirements. Therefore, habitat requirements for Anastasia and Southeastern beach mice are similar to those identified above (Section 7.02.6 (b)(1)(b)) for the Perdido Key, Choctawhatchee, and St. Andrews beach mice.

(c) Critical Habitat.

Currently there are no areas designated by the USFWS as critical habitat for both the Southeastern beach mouse and the Anastasia beach mouse.

c. Project Impacts.

Generally, the placement of sediment on the beach and associated construction operations occur seaward of the toe of the existing primary dune line (See Section 4.02) and; therefore, would not impact existing beach mouse habitat. Pipeline routes for beach construction projects will avoid identified primary constituent elements for critical habitat to the maximum extent practicable. For shoreline protection projects that include the construction of a primary dune, if dune habitat already exists, the constructed primary dune will tie into the existing dune and will not impact existing beach mouse habitat. However, depending on their seaward distance from the primary dune, small vegetated embryo dune features are utilized by beach mice as potential foraging and burrowing sites as well as refuge from predators. These embryo dunes located seaward of the primary dune may be buried during construction operations and borrowing, foraging, and refuge opportunities will be lost until new embryo dunes begin to form and are vegetated.

Severe beach erosion associated with hurricane and strong storm events has led to the degradation of beach mouse habitat and subsequent population decline. Considering that much of the mature coastal barrier sand dunes and scrub dune habitat on the Gulf and Atlantic coasts of Florida have been lost and populations of beach mice have declined as a result, the development of new habitat or enhancement of existing habitat is beneficial to the recovery goals of beach mice. Beach placement of sediment and, in some cases, construction of a primary dune, would help in the development of new beach mouse habitat and may aid in the enhancement and expansion of existing populations by (1) stabilizing or enhancing the existing dune communities with additional beach fill and associated aeolian transport of sediment and/or (2) protection of existing habitat from a constructed primary dune. Constructed dune features associated with shoreline protection projects often include dune grass plantings consisting of native beach grasses to help stabilize sediments. These native dune grasses would contribute to the primary constituent elements for critical habitat by providing food resources for beach mice.

d. Critical Habitat - Impacts (Perdido Key, Choctawhatchee, and St. Andrews Beach Mice).

The placement of sediment on the beach and associated construction operations will occur seaward of the toe of the existing primary dune line and; therefore, would not impact existing beach mouse habitat. However, if the pipeline access point, pipeline staging area, pipeline route, and associated construction activities can not avoid impacting the dune environment, the project may impact identified primary constituent elements for critical habitat (See Section 4.02). Heavy equipment, pipe, etc. may disrupt the contiguous mosaic of primary, secondary, and scrub vegetation and dune structure by disturbing dune vegetation and breaking the connectivity between habitat types. Reduced vegetation could impact foraging, refuge, and burrow opportunities. Pipe segments and the connected pipeline may function as a physical barrier to scrub dunes that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane-induced storm surge. Lighting associated with the staging area, disposal area, etc. could disturb the natural light regime within the coastal dune ecosystem, and could disrupt the nocturnal activity of beach mice.

(1) <u>Critical Habitat - Effect Determination</u>

The proposed project may affect the primary constituent elements of critical habitat for the Choctawhatchee, Perdido Key, and St. Andrews beach mice

e. <u>Effect Determination.</u>

Beach fill and constructed dune features associated with shoreline protection projects may enhance existing habitat or establish new habitat for beach mice. However; though, the placement of sediment on the beach and associated construction activities will avoid the primary constituent elements for critical habitat to the maximum extent practicable, the risk of direct and indirect impacts to the beach mouse and its existing habitat still exist. Therefore, the proposed actions may affect the Perdido Key, Choctawhatchee, and St. Andrews beach mice on the Gulf Coast and the Southeastern and Anastasia beach mice on the Atlantic Coast. For projects where avoidance of habitat features is not a practical alternative, impacts to beach mice may be minimized through the implementation of a trapping and relocation plan. If the project avoids all habitat features, the proposed project may affect but is not likely to adversely affect the beach mouse.

7.02.8 Sea Turtles.

a. Status.

Loggerhead *Caretta caretta* Threatened
Green *Chelonia mydas* Threatened[1]
Hawksbill *Eretmochelys imbricate* Endangered
Leatherback *Dermochelys coriacea* Endangered
Kemp's Ridley *Lepidochelys kempii* Endangered

[1]Green turtles are listed as threatened, except for breeding populations in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

b. Background.

Three species of sea turtles, the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), and the leatherback sea turtle (*Dermochelys coriacea*) nest regularly on Florida's beaches. Two other species, the Kemp's Ridley sea turtle (*Lepidochelys kempii)* and the hawksbill sea turtle (*Eretmochelys imbricata*) nest infrequently. All five species are listed as either threatened or endangered under the Endangered Species Act. Several biological opinions provided by the USFWS, for previous beach placement actions, discuss in detail the background information for sea turtles including status and distribution, behavior, life history, population dynamics, etc. and are included by reference below:

US Fish and Wildlife Service. Biological Opinion, March 13, 2006. Port Everglades Operations and Maintenance, Broward County, Florida. Service Log Number: 4-1-05-TR-7304.

US Fish and Wildlife Service. Biological Opinion, September 7, 2001. Mexico Beach Canal Sand Bypass, Gulf of Mexico, Bay County, Florida. Public Notice 200100140 (IP-DHB).

US Fish and Wildlife Service. Biological Opinion, February 20, 2003. Beach placement of dredge material from the Panama City Harbor Channel Maintenance Dredging.

US Fish and Wildlife Service. Biological Opinion, April 30, 2004. Walton County City of Destin Beach Restoration Gulf of Mexico, Walton and Okaloosa Counties, Florida. Public Notice SAJ-2003-8314-IP-TLZ.

US Fish and Wildlife Service. Biological Opinion, June 16, 2003. Placement of Beach Quality Material on Amelia Island, Nassau County, Florida as a result of maintenance dredging King Bay Entrance Channel in the St. Mary's River.

US Fish and Wildlife Service. Biological Opinion, August 18, 2003. Re-occurring beach nourishment activities on Amelia Island, Nassau County, Florida.

US Fish and Wildlife Service. Biological Opinion, January 10, 2005. Beach nourishment project Duval County, Florida.

US Fish and Wildlife Service. Biological Opinion, April 26 2000. Broward County Shore Protection Project. Application Number: 99905545 (IP-DSG).

Specific beach placement activities throughout the Atlantic and Gulf coasts of Florida (See Section 2.0) and subsequent potential impacts to the nesting activities of sea turtles including: beach slope, escarpments, compaction, incubation environment, lighting, etc. are discussed in this assessment.

(1) Statewide Nesting.

Sea turtle nesting occurs throughout the State of Florida in all coastal counties with the exception of those in the Big Bend area. The highest nesting densities are located along the southeastern coast from Brevard to Palm Beach Counties. The Florida sea turtle monitoring program, through the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute, coordinates two sea turtle monitoring programs, the Statewide Nesting Beach Survey (SNBS) and the Index Nesting Beach Survey (INBS). The SNBS was initiated in 1979 in order to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. For the past 17 years, the INBS has coordinated a detailed monitoring program in conjunction with SNBS. The INBS program was established to measure seasonal productivity, allowing comparisons between beaches and between years. Of the 190 SNBS surveyed areas, 33 participate in the INBS program. Data are gathered through a network of permit holders and are used to evaluate and minimize the effects of human activities on turtles and their nests and identify important areas for enhanced protection and land acquisition (http:// www.floridamarine.org). The nesting activity for each county from 1988-2005 is provided in Appendix 7 and the average sea turtle nesting density by county is provided in Figure 4 .

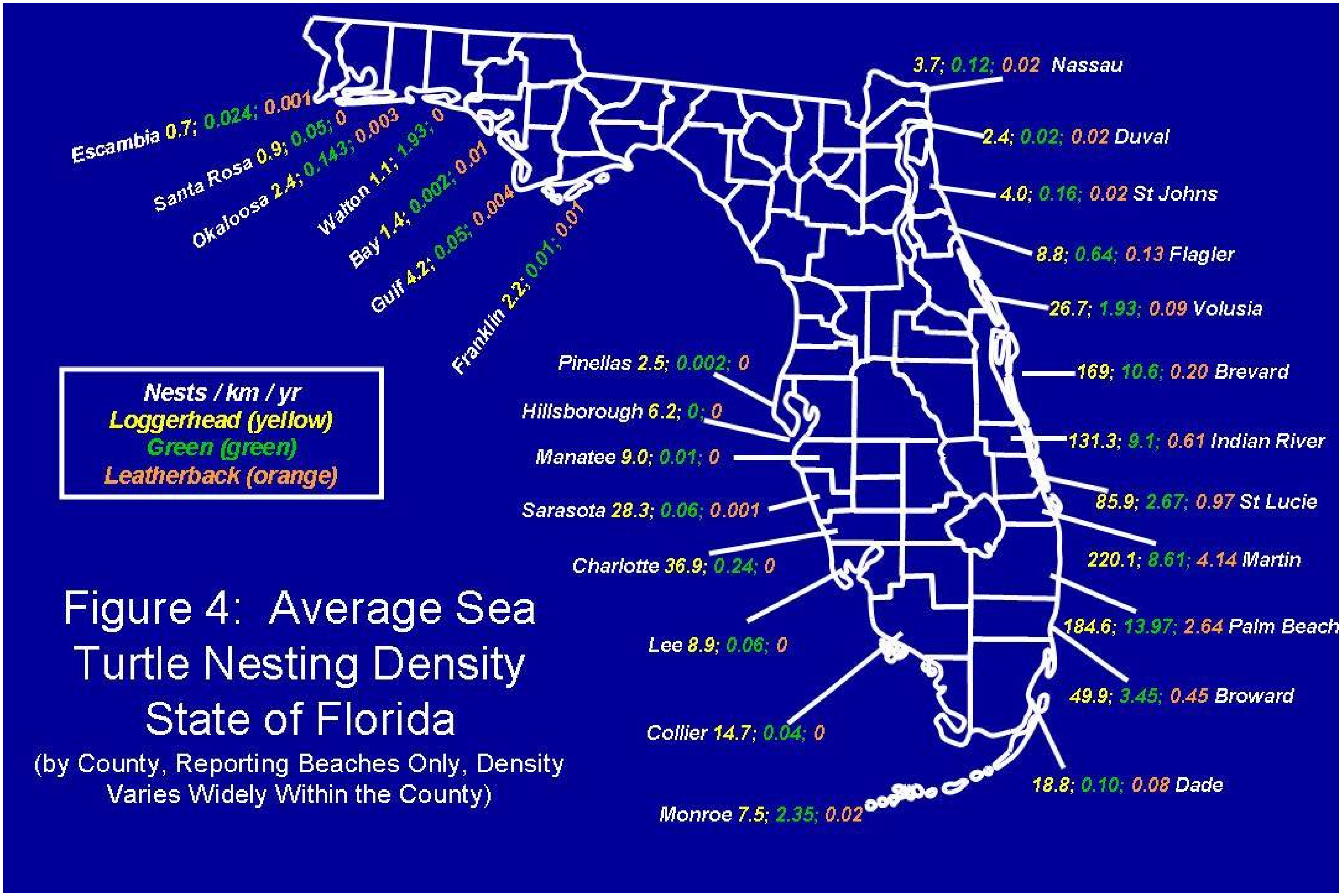


Figure 4: Average Sea Turtle Nesting Density State of Florida

(by County, Reporting Beaches Only, Density Varies Widely Within the County)

(2) Nesting Success.

Nesting success ((total # nests) / (total # nests + total # false crawls)) has been calculated for the reporting beaches within each county for both the Atlantic and Gulf coasts of Florida and is provided in Appendix 7.

c. <u>Critical Habitat.</u>

Critical habitat has not been designated in the continental U.S.; therefore, the proposed actions would not result in an adverse modification to identified critical habitat.

d. <u>Windows.</u>

To the maximum extent practicable, all construction activities on the beach will be scheduled to avoid the sea turtle nesting season. The limits of the nesting season window are dependent on the known nesting sea turtle species and the earliest and latest documented nesting events for that species within the identified project area (See Appendix 7). The nesting density and the species of nesting sea turtles vary throughout the Atlantic and Gulf coasts with a majority of the nesting activity and the number of nesting species occurring along the Southeastern coast of Florida. Considering that nesting windows differ throughout various regions of the state depending on the species present and earliest recorded nesting event, some aspect of sea turtle nesting activity (nesting, incubation, hatch out, etc.) will likely occur within a given region of the state almost year round.

For any given project, if the nesting season cannot be avoided, all available data associated with the nesting activities within the project area will be utilized to consider risks of working within various portions of the nesting season. Variables to consider will include the conditions of the pre-project nesting habitat such as erosion rates, existing hard structures, development, recreational use, etc., as well as the nesting density within the project area. An evaluation of these variables will be used to potentially incorporate project modifications (i.e. modified pipeline routes, staging areas, etc.) during the nesting season that may avoid or minimize potential impacts.

Upon evaluation of site-specific conditions, if nourishment beach activities extend into portions of the nesting season, monitoring for sea turtle nesting activity will be considered throughout the construction area including the disposal area and beachfront pipeline routes in accordance with guidelines provided by the USFWS (Appendix 8). The location and operation of heavy equipment within the project area will be limited to daylight hours to the maximum extent practicable in order to minimize impacts to nesting sea turtles. Monitoring for nest activity during the period of time prior to the commencement of construction activities may be required under certain circumstances so that nests laid in a potential construction zone can be relocated outside of the construction zone prior to project commencement to avoid potential losses. Depending on the species of nesting sea turtles (i.e. leatherbacks), specific night-time monitoring protocol may be implemented so that egg chambers can be identified. However, relocation measures should be considered as a last alternative (See Section 7.02.8 (e)(4)).

If construction occurs during the nesting season, the following direct impacts may occur:

(1) Both stockpiled pipe on the beach and the pipeline route running parallel to the shoreline may impede nesting sea turtles from accessing more suitable nesting sites.
(2) The operation of heavy equipment on the beach may impact incubating nests.
(3) During nighttime operations, the nourishment construction process, including heavy equipment use and associated lighting, may deter nesting females from coming ashore and disorient emerging hatchlings down the beach.
(4) Burial of existing nests may occur if missed by monitoring efforts.
(5) Escarpment formations and resulting impediment to nesting females.
(6) Reduced nest success as a result of relocation efforts.

Direct impacts associated with construction activities during the nesting season as well as indirect impacts associated with changes to the nesting and incubating environment, from the placement of sediment from alternate sources on the beach, are discussed in detail in the following section.

e. <u>Project Impacts.</u>

Post-nourishment monitoring efforts have documented potential impacts on nesting loggerhead sea turtles for many years (Fletemeyer, 1984; Raymond, 1984b; Nelson and Dickerson, 1989; Ryder, 1993; Bagley *et al*., 1994; Crain *et al*., 1995; Milton *et al*., 1997; Steinitz *et al.*, 1998; Trindell *et al*., 1998; Davis *et al*., 1999; Ecological Associates, Inc., 1999; Herren, 1999; Rumbold *et al*., 2001; Brock, 2005). Results from these studies indicate that, in most cases, nesting success decreases during the year following nourishment as a result of escarpments obstructing beach accessibility, altered beach profiles, and increased compaction. A comprehensive post-nourishment study conducted by Ernest and Martin (1999) documented an increase in abandoned nest attempts on nourished beaches compared to control or pre-nourished beaches as well as a change in nest placement with subsequent increase in wash-out of nests during the beach equilibration process. Contrary to previous studies, this study suggests that a post-nourishment decline in nest success is more likely a result from changes in beach profile than an increase in beach compaction and escarpment formation. According to Brock (2005), the sediment used for the nourishment of Brevard County beaches in Florida offered little or no impediment to sea turtles attempting to excavate an egg chamber. Furthermore, the physical attributes of the nourished sediment did not facilitate excessive scarp formation and; therefore, turtles were not limited in their ability to nest across the full width of beach. However, a decrease in nest success was still documented in the year following nourishment with an increase in loggerhead nesting success rates during the second season post-nourishment. This was attributed to increased habitat availability following the equilibration process of the seaward crest of the berm. This study suggests that, if compatible sediment and innovative design methods are utilized to minimize post-nourishment impacts documented in previous studies, than the post-nourishment decrease in nest success without the presence of scarp formations, compaction, etc. may indicate an absence of abiotic and or biotic factors that cue the female to initiate nesting.

As suggested by the historical literature, there are inherent changes in beach characteristics as a result of mechanically placing sediment on a beach from alternate sources. The change in beach characteristics often result in short-term decreases in nest success and/or alterations in nesting processes. Based on the available literature, it appears that these impacts are, in many cases, site specific. Careful consideration must be placed on pre- and post-project site conditions and resultant beach characteristics after beach-fill episode at a given site in order to thoroughly understand identified post-project changes in nesting processes. By better understanding potential project specific impacts, modifications to project templates and design can be implemented to improve habitat suitability. The following sections review, more specifically, documented direct or indirect impacts to nesting females and hatchlings.

(1) Pipe Placement.

A general discussion of the construction activities associated with the placement of sediment on the beach, including pipeline routes, is included in Section 4.02 of this report. If construction operations extend into the sea turtle nesting season (See Section 7.02.8 (d)), pipeline routes and pipe staging areas may act as an impediment to nesting females approaching available nesting habitat or to hatchlings orienting to the waters edge. If the pipeline route or staging areas extend along the beach face, including the frontal dune, beach berm, mean high water line, etc., some portion of the available nesting habitat will be blocked. Nesting females may either encounter the pipe and false crawl, or nest in front of the pipeline in a potentially vulnerable area to heavy equipment operation, erosion, and washover. If nests are laid prior to placement of pipe and are landward of the pipeline, hatchlings may be blocked or mis-oriented during their approach to the water.

Though pipeline alignments and staging areas may pose impacts to nesting females and hatchlings during the nesting season, several measures can be implemented to minimize these impacts. If construction activities are scheduled to begin after the start of the nesting season, monitoring should be done in advance to document all nests within the proposed area. Construction operations and pipeline placement could be modified to bypass existing nests. If bypassing is not a practical alternative for a given project, the relocation of nests outside of construction areas could be implemented as a last resort (See Section 7.02.8 (e)(4)). Throughout the period of sea turtle nesting and hatching, construction pipe that is placed on the beach parallel to the shoreline could be placed as far landward as possible so that a significant portion of available nesting habitat can be utilized and nest placement is not subject to inundation or wash out. Furthermore, temporary storage of pipes and equipment can be located off the beach to the maximum extent practicable. If placement on the beach is necessary, it will be done in a manner so as to impact the least amount of nesting habitat by placing pipes perpendicular to shore and as far landward as possible without compromising the integrity of the existing or constructed dune system.

(2) Slope and Escarpments.

Beach nourishment projects are designed and constructed to equilibrate to a more natural profile over time relative to the wave climate of a given area. Changes in beach slope as well as the development of steep escarpments may develop along the mean high water line as the constructed beach adjusts from a construction profile to a natural beach profile (Nelson *et al.*, 1987). For the purposes of this assessment, escarpments are defined as a continuous line of cliffs or steep slopes facing in one general direction, which is caused by erosion or faulting. Depending on shoreline response to the wave climate and subsequent equilibration process for a given project, the slope both above and below mean high water may vary outside of the natural beach profile; thus resulting in potential escarpment formation. Though escarpment formation is a natural response to shoreline erosion, the escarpment formation as a result of the equilibration process during a short period following a nourishment event may have a steeper and higher vertical face than natural escarpment formation and may slough off more rapidly landward.

Adult female turtles survey a nesting beach from the water before emerging to nest (Carr and Ogren, 1960; Hendrickson, 1982). Parameters considered important to beach selection include the geomorphology and dimensions of the beach (Mortimer, 1982; Johannes and Rimmer, 1984) and bathymetric features of the offshore approach (Hughes, 1974; Mortimer, 1982). Beach profile changes and subsequent escarpment formations may act as an impediment to a nesting female resulting in a false crawl or nesting females may choose marginal or unsuitable nesting areas either within the escarpment face or in front of the escarpment. Often times these nests are vulnerable to tidal inundation or collapse of the receding escarpment. If a female is capable of nesting landward of the escarpment prior to its formation, as the material continues to slough off and the beach profile approaches a more natural profile, there is a potential for an incubating nest to collapse or fallout during the equilibration process. Loggerheads preferentially nest on the part of the beach where the equilibration process takes place (Brock, 2005; Ecological Associates, Inc., 1999) and are more vulnerable to fallout during equilibration. However, according to Brock (2005), the majority of green turtle nests are placed on the foredune and; therefore, the equilibration process of the nourished substrate may not affect green turtles as severely.

A study conducted by Ernest and Martin (1999) documented increased abundance of nests located further from the toe of the dune on nourished vs. control beaches. Thus, post-nourishment nests may be laid in high-risk areas where vulnerability to sloughing and equilibration are greatest. Though nest relocation is not encouraged (See Section 7.02.8 (e)(4)), considering that immediately following nourishment projects the likelihood of beach profile equilibration and subsequent sloughing of escarpments as profile adjustment occurs, nest relocation may be used to move nests that are laid in locations along the beach that are vulnerable to fallout (i.e. near the mean high water line). As a nourished beach is re-worked by natural processes and the construction profile approaches a more natural profile, the frequency of escarpment formation declines and the risk of nest loss due to sloughing of escarpments is reduced. According to Brock (2005), the return of loggerhead nesting success to equivalent rates similar to those on the adjacent non-nourished beach and historical rates two seasons post-nourishment were observed and are attributed to the equilibration process of the seaward crest of the berm.

Though the equilibration process and subsequent escarpment formation are features of most beach projects, management techniques can be implemented to reduce the impact of escarpment formations. For completed sections of beach during beach construction operations, and for subsequent years following as the construction profile approaches a more natural profile, visual surveys for escarpments could be performed. Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 ft.) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the US Fish and Wildlife Service.

The Corps is currently working with the Florida DEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop alternative design criteria that may minimize these impacts. Project design modifications to develop a more “turtle friendly” beach profile could potentially increase post-nourishment nest density and success. A draft final report for phase one of this study, “Assessment of Alternative Construction Template for Beach Nourishment Projects,” is currently being reviewed. Recommended design modifications from this report will be statistically evaluated to assess potential impacts of the design changes on nesting sea turtles. Based on the final results and feasibility of recommendations, the Corps will incorporate, to the maximum extent practicable, ‘turtle friendly’ beach profile criteria in future project designs in order to enhance sea turtle nesting habitat requirements.

(3) Incubation Environment.

Physical changes in sediment properties that result from the placement of sediment, from alternate sources, on the beach pose concerns for nesting sea turtles and subsequent nest success. Constructed beaches have had positive effects (Broadwell, 1991; Ehrhart and Holloway-Adkins, 2000; Ehrhart and Roberts, 2001), negative effects (Ehrhart, 1995; Ecological Associates, Inc., 1998), or no apparent effect (Raymond, 1984b.; Nelson *et al*., 1987; Broadwell, 1991; Ryder, 1993; Steinitz *et. al.*, 1998; Herren, 1999) on the hatching success of marine turtle eggs. Differences in these findings are related to the differences in the physical attributes of each project, the extent of erosion on the pre-existing beach, and application technique (Brock, 2005).

If nesting occurs in new sediment following beach construction activities, embryonic development within the nest cavity can be affected by insufficient oxygen diffusion and variability in moisture content levels within the egg clutch (Ackerman, 1980; Mortimer, 1990; Ackerman *et al*., 1992); thus, potentially resulting in decreased hatchling success. Ambient nest temperature and incubation time are affected by changes in sediment color, sediment grain size, and sediment shape as a result of beach nourishment (Milton *et al.*, 1997) and; thus, affect incubation duration (Nelson and Dickerson, 1988a). Sexual differentiation in chelonians depends on the temperature prevailing during the critical incubation period of the eggs (Pieau, 1971; Yntema, 1976; Yntema and Mrosovsky, 1979; Bull and Vogt, 1979), which occurs during the middle third of the incubation period (Yntema, 1979; Bull and Vogt, 1981; Pieau and Dorizzi, 1981; Yntema and Mrosovsky, 1982; Ferguson and Joanen, 1983; Bull, 1987; Webb *et al*. 1987; Deeming and Ferguson, 1989; Wibbels *et al*., 1991), and possibly during a relatively short period of time in the second half of the middle trimester (Webster and Gouviea, 1988). Eggs incubated at constant temperatures of 28°C or below develop into males. Those kept at 32°C or above develop into females. Therefore, the pivotal temperature, those giving approximately equal numbers of males and females, is approximately 30°C (Yntema and Mrosovsky, 1982). Estimated pivotal temperatures for loggerhead sea turtles nesting in North Carolina, Georgia, and southern Florida are close to 29.2°C (Mrosovsky and Provancha, 1989). Therefore, fluctuation in ambient nest temperature on constructed beaches could directly impact sex determination if nourished sediment differs significantly from that found on the natural beach. Since, the pivotal temperatures for the northern and southern geographic nesting ranges of loggerheads in the United States are similar, a higher percentage of males are produced on North Carolina beaches and a higher percentage of females on Florida beaches. Hatchling sex ratios are of conservational significance (Mrosovsky and Yntema, 1980; Morreale *et al*., 1982) since they may affect the population sex ratio and thus could alter reproductive success in a population (Hanson *et al*., 1998).

This assessment assumes sediment being placed on the beach meets the Florida Department of Environmental Protection's (FDEP) sediment compatibility requirements for beach and nearshore placement (62B-41.007 (2) (j-k)) (http://www.dep.state.fl.us/legal/Rules/mainrulelist.htm) (Appendix 1) and; therefore, sediment characteristics should be compatible with native beaches. Projects that fall outside the scope of FDEP compatibility standards are not covered under this assessment.

(4) Nest Relocation.

Relocation of sea turtle nests to less vulnerable sites was once common practice throughout the southeastern U.S. to mitigate the effects of natural or human induced factors. However, the movement of eggs creates opportunities for adverse impacts. Therefore, more recent USFWS guidelines are to be far less manipulative with nests and hatchlings to the maximum extent practicable. Though not encouraged, nest relocation is still used as a management technique of last resort where issues that prompt nest relocation cannot be resolved. Potential adverse impacts associated with nest relocation include: survey error (Shroeder, 1994), handling mortality (Limpus *et al.* 1979; Parmenter 1980), incubation environment impacts (Limpus *et al*., 1979; Ackerman, 1980; Parmenter, 1980; Spotila *et al*., 1983; McGehee, 1990) (See Section 702.8 (e)(3)), hatching and emergence success, and nest concentration.

Beach construction projects are scheduled, to the maximum extent practicable, to work outside of the sea turtle nesting season (See Section 7.02.8(d)) in order to avoid impacts to nesting females and the nest incubation environment. However, in some instances where the nesting season cannot be avoided, nest relocation is used as a management tool to re-locate nests laid in the impact area to areas that are not susceptible to disturbance. For any given project, if the earliest documented nest attempt precludes the project commencement or completion date, nest relocation may be used as a last resort mitigation effort. If relocation is implemented, the proper protocol established by the FDEP and USFWS will be adhered to in order to avoid the potential adverse impacts outlined above. On leatherback nesting beaches, considering the increased risk of finding and relocating nests, additional species specific relocation requirements will be implemented (i.e. night time monitoring and relocation) to assure that nests are not missed.

(5) Compaction.

Sediment placed on the beach, as a component of shoreline protection projects, beach disposal, sand-bypassing, etc. (See Section 4.00) is often obtained from three main sources: inlets, channels, or offshore borrow sites (Crain *et al*., 1995) with occasional use of upland sources. Significant alterations in beach substrate properties may occur with the input of sediment types from other sources. Sediment density (compaction), shear resistance (hardness), sediment moisture content, beach slope, sediment color, sediment grain size, sediment grain shape, and sediment grain mineral content can be changed by beach nourishment. Changes in particle size can have a direct influence on the shear resistance of the sediment and therefore make the beach relatively harder after nourishment. Harder or more compact nourished beaches result primarily from angular, finer grain sediment dredged from stable offshore borrow sites, whereas less compacted beaches result from smoother, coarse sediment dredged from high energy locations such as inlets (Nelson and Dickerson, 1989). Significant reductions in nesting success (i.e. increase in number of false crawls) have been documented on severely compacted nourished beaches (Fletemeyer, 1980; Raymond, 1984b; Nelson and Dickerson, 1987; Nelson *et al.*, 1987). Hard sediment can prevent a female from digging a nest or result in a poorly constructed nest cavity. Females may respond to harder physical properties of the beach by spending more time on the beach nesting, which may result in physiological stress and increased exposure to disturbances and predation; thus, in some cases leading to a false dig (Nelson and Dickerson, 1989).

Compaction impacts can be minimized by using compatible sand. Some studies suggest that tilling compacted sand after project completion can be performed to reduce compaction to levels comparable to unnourished beaches. Under current USFWS guidelines, the decision to till a beach after sediment placement is based upon measurements of sediment compaction (Nelson and Dickerson, 1988a) using a cone penetrometer (Nelson, 1987). According to the USFWS compaction measurement guidelines outlined below, compaction measurements of 500 PSI, are currently used as a threshold to assess impacts of compaction to sea turtle nesting behavior and the necessity for beach tilling to mitigate compaction impacts.

General USFWS Compaction Guidelines

Immediately after the beach construction operation is complete and prior to May 1, for three subsequent years, sediment compaction should be evaluated within the limits of the construction area in accordance with a protocol agreed to by the Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission. If the decision is made to till regardless of post-construction compaction levels, compaction monitoring will not be performed. For all circumstances where tilling is implemented, the designated area shall be tilled to a depth of 36 inches. Tilling will be performed (i.e. overlapping rows, parallel and perpendicular rows, etc.) so that all portions of the beach are tilled and no furrows are left behind All tilling activities must be completed prior to May 1. If the project is completed during the nesting season all tiling operations will be coordinated with the appropriate sea turtle beach monitoring representatives. Tilling will not be performed in areas where nests have been left in place or relocated. A report on the results of compaction monitoring shall be submitted to the Fish and Wildlife Service prior to any tilling actions being taken. An annual summary of compaction surveys and the actions taken must be submitted to the Fish and Wildlife service.

If tilling is not performed immediately following construction activities and compaction monitoring is implemented, at a minimum, the following protocol will be followed:

1. Compaction sampling stations will be located at 500-foot intervals along the project area. One station will be at the seaward edge of the dune/bulkhead line (when material is placed in this area); and one station must be midway between the dune line and the high water line (normal wrack line).

At each station, the cone penetrometer will be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. Layers of highly compact material may lie over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth will be averaged to produce final values for each depth at each station. Reports will include 18 values for each transect line, and the final 6 averaged compaction values.

2. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to May 1. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service will be required to determine if tilling is required. If a few values exceeding 500 psi are randomly present within the project area, tilling will not be required.

Though the cone penetrometer may be effective in measuring compaction values, a study performed by Piatkowski *et al.* (2001) suggests that the cone penetrometer values are dependent on the mass of the person using the instrument in densely compacted substrates and care must be taken when comparing values among varying users. Post-nourishment compaction investigations should consider the variability among users as a variable in skewing data. Furthermore, Ferrell *et al.* (2001) investigated the strengths and weaknesses of several different types of instruments that measure sediment compaction and shear resistance suggesting that other instruments may be more suitable for measuring beach compaction relative to sea turtle nesting behavior. Because of instrument error and given that turtles do not dig vertically in the same fashion as a penetrometer moves through the sediment layers, some have concluded that penetrometers are not appropriate for assessing turtle nesting limitations (Davis *et al.*, 1999).

According to Davis et al. (1999), on the Gulf Coast of Florida (1) there was no relationship between turtle nesting and sediment compactness, (2) the compactness ranges and varies widely in both space and time with little rationale, (3) tilling has a temporary influence on compactness and no apparent influence on nesting frequency, (4) and current compactness thresholds of 500 psi are artificial. According to Brock (2005), the physical attributes of the fill sand for Brevard County beaches did not result in severe compaction and therefore did not physically impede turtles in their attempts to nest. Therefore, additional studies should be considered to evaluate the validity of this threshold (500 PSI) and its general application across all beaches as a means to assess beach-tilling requirements. If sediment characteristics are similar to the native beach and sediment grain sizes are homogenous, the resultant compaction levels will likely be similar to the native beach and tilling should not be encouraged. A study by Nelson and Dickerson (1988b) documented that a tilled nourished beach will remain un-compacted for up to one year; however, this was a site-specific study and for some beaches it may not be necessary to till beaches in the subsequent years following nourishment.

In some cases, though sediment placed on the beach is compatible with the native sediment characteristics and the resultant compaction is similar to the native beach, tilling is still encouraged regardless of compaction levels. It has been suggested that, in some cases, the process of tilling a beach, with compaction levels similar to native beach, may have an effect on sea turtle nesting behavior and nest incubation environment. Research on evaluating tilling impacts to nesting turtles is limited. Therefore, the idea of not tilling beaches (immediately following and/or during consecutive years after construction operations) where compatible sediments are used and compaction levels are similar to the native beach should be taken into consideration on a case-by-case basis in order to account for potential impacts of tilling activities on nest success.

(7) Lighting.

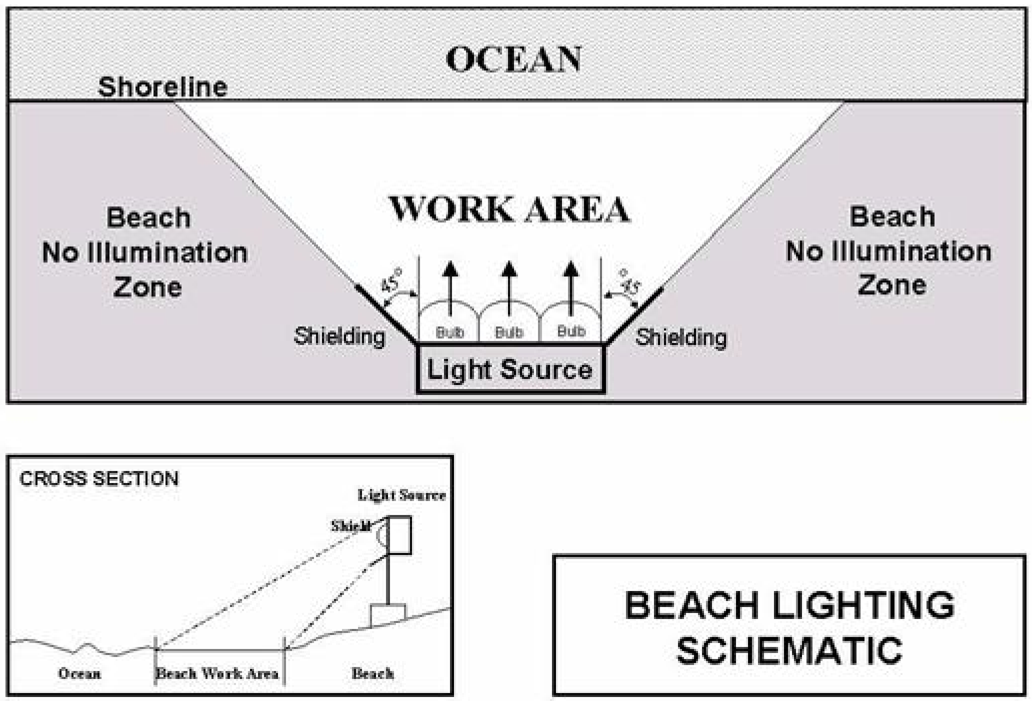
The presence of artificial lighting on or within the vicinity of nesting beaches is detrimental to critical behavioral aspects of the nesting process including nesting female emergence, nest site selection, and the nocturnal sea-finding behavior of both hatchlings and nesting females. Artificial lighting on beaches tends to deter sea turtles from emerging from the sea to nest; thus, evidence of lighting impacts on nesting females is not likely to be revealed by nest to false crawl ratios considering that no emergence may occur (Mattison *et al*., 1993; Witherington, 1992; Raymond, 1984a.)). Though nesting females prefer darker beaches (Salmon *et al.*, 1995), considering the increased development and associated lighting on most beaches, many do nest on lighted shorelines. Although the effects of lighting may prevent female emergence, if emergence, nest site selection, and oviposition does occur, lighting does not affect nesting behavior (Witherington and Martin, 2003). However, sea turtles rely on vision to find the sea upon completion of the nesting process and use a balance of light intensity within their eyes to orient towards the brightest direction (Ehrenfeld, 1968); thus, misdirection by lighting may occur resulting in more time being spend to find the ocean. Furthermore, successful nesting episodes on lighted shorelines will directly effect the orientation and sea-finding process of hatchlings during the nest emergence and frenzy process to reach the ocean. Hatchlings rely almost exclusively on vision to orient to the ocean and brightness is a significant cue used during this immediate orientation process after hatch out (Mrosovsky and Kingsmill, 1985; Verheijen and Wilschut, 1973; Mrosovsky and Shettleworth, 1974; Mrosovsky *et al*., 1979). Hatchlings that are mis-oriented (oriented away from the most direct path to the ocean) or disoriented (lacking directed orientation or frequently changing direction or circling) from the sea by artificial lighting may die from exhaustion, dehydration, predation, and other causes. Though hatchlings use directional brightness of a natural light field (celestial sources) to orient to the sea, light from artificial sources interferes with the natural light cues resulting in misdirection (Witherington and Martin, 2003).

The impact of light on nesting females and hatchlings can be minimized by reducing the number and wattage of light sources or by modifying the direction of light sources through shielding, redirection, elevational modifications, etc. If shielding of light sources is not effective, it is important that any light reaching the beach has spectral properties that are minimally disruptive to sea turtles like long wavelength light. The spectral properties of low-pressure sodium vapor lighting are the least disruptive to sea turtles among other commercially available light sources.

During construction operations that include the placement of sediment on the beach (See Section 4.02), lighting is required during nighttime activities at both the dredging site and the location on the beach where sediment is being placed. In compliance with the US Army Corps of Engineers Safety and Health Requirements Manual (2003), a minimum luminance of 30 lm/ft^2 is required for dredge operations and a minimum of 3 lm/ft^2 is required for construction activities on the beach. For dredging vessels, appropriate lighting is necessary to provide a safe working environment during nighttime activities on deck (i.e. general maintenance work deck, endangered species observers, etc.). During beach construction operations, lighting is generally associated with the active construction zone around outflow pipe and the use of heavy equipment in the construction zone (i.e. bulldozers) in order to maintain safe construction operations at night. Furthermore, on newly nourished beaches where the elevation of the beach berm is raised for shoreline protection purposes, it is possible that lighting impacts to nesting females and emerging hatchlings from adjacent lighting sources (streets, parking lots, hotels, etc) may become more problematic as shading from dunes, vegetation, etc. is not longer evident (Brock, 2005; Ehrhart and Roberts, 2001). In a study on Brevard county beaches, Brock (2005) found that loggerhead hatchling disorientations increased significantly post-nourishment. This was attributed to the increase in light sources not previously visible to be seen by hatchlings as a result of the increase in profile elevation combined with an easterly expansion of the beach.

If beach construction activities occur during the sea turtle nesting and hatching season, all lighting associated with project construction will be minimized to the maximum extent practicable while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements. Direct lighting of the beach and near shore waters will be limited the immediate construction area(s). Lighting aboard dredges and associated vessels, barges, etc. operating near sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with the Corps, U.S. Coast Guard, and OSHA requirements. Lighting on offshore or onshore equipment will be minimized through reduced wattage, shielding, lowering, and/or use of low pressure sodium lights, in order to reduce illumination of adjacent beach and nearshore waters will be used to the extent practicable (Figure 5). Shielded low-pressure sodium vapor lights have been identified by the FWCC as the best available technology for balancing human safety and security, roadway illumination, and endangered species protection. They provide the most energy efficient, monochromatic, long-wavelength, dark sky friendly, environmentally sensitive light of the commercially available street lights and will be highly recommended for all lights on the beach or on offshore equipment (Gallagher, 2006).

Figure 5. Beach lighting schematic identifying reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the sea turtle nesting beach and water.



The use of sea turtle friendly lighting has been shown to significantly improve beaches for sea turtle nesting. Implementing effective lighting ordinances or plans on major nesting beaches is a high priority for the USFWS. Therefore, in conjunction with all proposed beach projects, local lighting ordinances will be encouraged to the maximum extent practicable in order to reduce lighting impacts to nesting females and hatchlings. The applicant or local sponsor will be encouraged to work with the USFWS, local monitoring groups, and other concerned organizations to develop the best plan for each project specific environment.

(8) Nearshore Disposal.

As discussed in Section 2.07, nearshore disposal is the placement of beach compatible dredged material in the intertidal or subtidal zones and within the littoral system. Hydraulic pipeline dredges are often associated with disposal in the intertidal zone whereas disposal occurring in the subtidal environment often require the use of split-hull hopper dredges. Placement of material in the nearshore zone (intertidal and/or subtidal) helps maintain the sediment budget by restoring littoral material, potentially resulting in beach accretion. Though an engineered design template is not a component of nearshore disposal, the dredged material may replenish the eroding beach in a natural manner (Herbich, 2000). If sediment placed in the nearshore environment supports accretion of the adjacent beach, sea turtle nesting habitat may become available as a result of nearshore disposal. Considering that the intent of nearshore disposal is to keep dredged sediment within the littoral zone and allow for natural distribution with longshore drift, there is no constructed beach but rather an accretion of sediment based on natural sediment distribution. The accretion of supra-tidal nesting habitat as a result of nearshore disposal of dredged sediment is unlikely. Nonetheless, if nesting habitat were created, the subsequent impact on nesting females and hatchlings would depend on sediment compatibility and sorting characteristics. Potential impacts are addressed in the previous subparagraphs of Section 7.07.8 (e).

Placement of sediments within the nearshore environment could potentially impact hard bottom communities and subsequent sea turtle foraging grounds. However, hard bottom evaluations are performed prior to designating nearshore disposal areas and all high relief hard bottom communities that constitute good foraging habitat for sea turtles are avoided. Therefore, no burial or sedimentation of hard bottom from nearshore disposal will occur; thus, nearshore disposal will not impact significant hard bottom foraging grounds. Projects that may impact hard bottom communities are not within the scope of this document and must be addressed through additional coordination and amendments to this document.

(9) Hard Structure.

On highly eroded shorelines, hard structure alternatives may be used (1) to protect upland structures against erosion (i.e. seawalls, revetments, sandbag / geo-tube structures, bulkheads, etc.) or (2) as a beach stabilization structure, in combination with beach fill activities, in order to retard erosion and increase the amount of time sediment remains on the beach (i.e. groins, breakwaters, and sills). Data summarized in 1996 indicate that 23% of Florida's east coast and 14 % of the west coast, concentrated in five areas of the state, were armored with some type of hard structure. The potential for future armoring encompasses the primary nesting beaches for sea turtles along the southeast and southwest coasts of Florida (Schroeder and Mosier, 2000; Mosier, 1998). The use of hard structures both parallel and perpendicular to the shoreline can lead to habitat loss for nesting sea turtles. In highly developed and erosive environments where hard structure is placed parallel to the shoreline for upland structure protection, without a natural dune or combined beach fill, scouring and undermining of the adjacent beach will occur resulting in total loss of habitat. Hard structures cause a reflection in wave energy which can increase erosion seaward of these structures, the intensity of longshore currents can be increased, moving sand away from the site more rapidly and in greater quantities, the natural exchange of sand between the dune and beach is prevented, and wave energy is concentrated at the ends of hard structures which can exacerbate erosion at adjacent, un-hardened beach (Schroeder and Mosier, 2000). Furthermore, accretion in one area, as a result of shore-perpendicular structures, is balanced by erosion elsewhere unless additional sand is introduced into the project area.

Hard Structures can both directly and indirectly affect sea turtles. Direct affects include: (1) prevention of access to suitable nesting sites, (2) abandonment of nesting attempts due to interaction with the structure, and (3) interference with proper nest cavity construction and nest covering. Furthermore, shore parallel hard structures such as T-head and other composite groins can (4) impede and/or trap nesting females and hatchlings, (5) concentrate predators, and (6) alter current regimes and longshore sediment transport. Indirect impacts include: (1) the permanent loss of nesting habitat or escarpment formation as a result of beach profile and width alteration; (2) increase in clutch mortality as a result of frequent inundation and/or exacerbated erosion, and (3) increase in hatchling and adult female energy expenditure in attempts to overcome structures.

As discussed in Section 4.03, hard structures can be shore parallel, shore perpendicular, long, short, high, low, permeable, and impermeable. Depending on its design, hard structures can physically block a nesting female from accessing a more suitable higher elevation nesting environment. In a study conducted by Mosier (1999) of three nesting beaches on the east coast of Florida, 86% of nesting females that encountered a hard structure during emergence returned to the water without nesting as a result of the inability to access higher elevation nesting habitat (Mosier, 1999). Nest that are laid in low elevation environments are vulnerable to wash out and nest incubation environments may be altered resulting in nest loss or decreased nest success. According to Lucas *et. al*. (2004), in a study designed to assess sea turtle response to beach attributes (i.e. hard structures), turtles emerged onto portions of the beach where anthropogenic structures threatened to block access to optimal nesting habitat; however, upon encountering the structures, turtles abandoned the nesting sequence. This study indicated that only the most seaward structures affected sea turtle nesting. Depending on the design of shore perpendicular structures such as straight and composite groins (*i.e*. T-head), the structure may act as an impediment or a trap (Foote *et. al*., 2002) to nesting females and/or hatchlings (Davis *et. al*., 2002). Stem features of the groin may be exposed above the beach surface or may be buried by accreting sand resulting in potential impediments to the nesting process either during nest site selection or during nest digging resulting in potential false crawls or false digs and subsequent increase in energy expenditure.

In most cases, groins are used as design components, in combination with beach fill, in “critical erosion” or hot spot areas. Therefore, pre-project nesting conditions are generally degraded with limited sea turtle crawl activity. According to Davis *et. al.* (2002), in Ocean Ridge, Florida, eight T-head groins were constructed in 1998 in combination with beach nourishment to restore eroded shoreline. The resultant beach was crenulate between the groins with the high water line at or slightly landward of the T-head resulting in increased crawl activity on the groin field beach despite the presence of groins compared to pre-project conditions. Though the stem burial of the T-groin and resultant tombolo formation within the groin field increased the available nesting habitat, the risk for hatchlings to encounter the T-groin and get trapped before entering the water increased. In order to prevent trapping of hatchlings, fencing was used to re-direct hatchlings away from the groin during hatch out resulting in 12% of the hatchlings being redirected from potential entrapment. Depending on the quantity of added beach fill, the rate of sediment accumulation, and the groin crest elevation, hatchlings may potentially be trapped by the stem or the "T-head" portion of the groin both in the water and/or on the beach. The resultant increased energy expenditure to traverse around a structure depletes the critical "frenzy" energy reserves of hatchlings necessary to reach the safety of offshore developmental areas. Furthermore, predator concentration, including bird and fish species, may occur within the vicinity of high relief hard structures. As hatchlings become trapped by the structure during egress offshore, the period of time which they are most vulnerable to predation increases resulting in increased losses.

Contrary to the accretion of beach as identified in the Ocean Ridge project from the use of groin structures, erosion of beaches may occur down-drift of a groin structure depending its design and purpose (see Section 4.03). If the structure functions as a barrier to the movement of littoral material, accretion may occur up-drift and erosion down-drift of the structure resulting in loss of nesting habitat and potential escarpment formation as down-drift erosion persists. However, groins designed with low crest elevation, weir sections, etc. allow for water and sediment to bypass through the structure to some degree and prevent or reduce the rate of down-drift erosion. Assuming that sufficient sediment is bypassed, erosion and escarpment concerns relative to approach of nesting females and incubating nests will be reduced. Furthermore, if groin crest elevation is below MLW or if gaps are incorporated to the structure design, the risk of hatchling entrapment during egress offshore as well as predation response will all also be reduced.

e. Effect Determination.

The proposed project could potentially affect sea turtles both directly and indirectly in the following ways: (1) Both stockpiled pipe on the beach and the pipeline route running parallel to the shoreline may impede nesting sea turtles from accessing more suitable nesting sites, (2) The operation of heavy equipment on the beach may impact nesting females and incubating nests, (3) Associated lighting impacts from the nighttime operations and the increased beach profile elevation may deter nesting females from coming ashore and disorient emerging hatchlings, (4) Burial of existing nests may occur if missed by monitoring efforts, (5) Escarpment formations and resulting impediment to nesting females as well as potential losses to the beach equilibration process, (6) Reduced nest success as a result of relocation efforts, (7) Sediment density (compaction), shear resistance (hardness), sediment moisture content, beach slope, sediment color, sediment grain size, sediment grain shape, and sediment grain mineral content can be altered potentially effecting the nesting and incubating environment, (8) Hard sediment can prevent a female from digging a nest or result in a poorly constructed nest cavity, (9) Changes in sediment properties and color could alter the temperature of the beach and incubating nests; thus influencing sex ratios, and (10) Hard structures (groins, breakwaters, etc.) may prevent access to suitable nesting sites, directly and indirectly interfere with the nesting process, impede and/or trap nesting females and hatchlings resulting in increased energy expenditure, concentrate predators, and alter longshore sediment transport and down-drift erosion.

The USACE plans to alleviate impacts to nesting sea turtles in the project area by implementing steps that are now common practice including, but not limited to, (1) design modifications, (2) contingency plans, (3) risk assessments, (4) sediment quality monitoring, (5) compaction tests, (6) tilling, (7) leveling escarpments in the fill, (8) monitoring for nests, etc.

Despite the implementation of placement windows, use of compatible sediment, and other necessary precautions to the maximum extent practicable, the chance of impacting nesting sea turtles and their incubating environment still exist. Therefore, it has been determined that the proposed actions may affect the loggerhead, green, Kemp's ridley, hawksbill, and leatherback sea turtles.

7.02.9 Beach Jacquemontia.

a. Status. Endangered

b. Background.

Beach jacquemontia (*Jacquemontia reclinata*) is a perennial vine located on the barrier islands of the southeastern Florida coast from Miami to Palm Beach County specifically: Palm Beach (eight sites), Broward (two sites), and Dade (two sites) counties. It has a main stem with laterals spreading from its rootstock. Leaves are entire, alternate, estipulate, spirally arranged, and almost always petiolate. Beach jacquemontia flowers from November to May, but may vegetatively propagate at any time.

There are about 100 species of the genus Jacquemontia, of which, beach jacquemontia is the only species found along the beaches of southeastern Florida. Surveys conducted in 2003-2004 estimate the total population to be 700 individuals on nine sites (USFWS, 2004). Habitat preferences include disturbed or sunny areas in the tropical maritime hammock or the coastal strand vegetation, typically on the crest and lee sides of stable dunes; however, seedling and young beach jacquemontia grow best when shaded. Occasionally plants can be found associated with sea oats (*Uniola paniculata*) within the beach dune community.

Loss of Habitat to urbanization and beach erosion led to the listing of beach jacquemontia as endangered on November 24, 1993 (USFWS, 1993). The current threats for recovery include continued loss of habitat and shading to invasive species (Australian pine, carrotwood, and Brazilian pepper) as well as urbanization and subsequent habitat loss among the barrier islands of South Florida. Considering that only a few plants may be present at any given site, viability of existing populations is uncertain. Furthermore, with continued habitat degradation and loss, limited geographic distribution, and small population sizes, population sustainability may only be attained through habitat management (i.e. exotic plant control), protection, and conservation measures (Johnson *et al*. 1990). Active management programs of propagation, germplasm conservation, and augmentation will be required for remaining populations. Successful re-establishment efforts occurred in 1989 at three sites in Crandon Park and continued success can be attained using re-establishment techniques as part of dune restoration projects. A recent study funded by the USFWS evaluated the reintroduction of beach jacquemontia, including specific recovery actions such as: 1) creating new introduced populations, 2) monitoring survival and reproduction of introduced individuals, 3) continuing *ex situ* conservation seed bank storage and 4) conducting demographic monitoring (USFWS, 2004). The data from this study will help better understand the requirements for successful reintroduction techniques and evaluate long-term trends in wild and reintroduced populations.

c. Potential Impacts.

There is no critical habitat designated for beach jacquemontia; thus, no critical habitat will be impacted. Beach placement of sediment will not occur within the identified habitat of beach jacquemontia. Though direct placement of sediment will not affect beach jacquemontia, pipeline routes may be located within identified habitat requirements depending on site conditions. For projects where known populations of beach jacquemontia exist, plant surveys will be performed, through coordination with USFWS, during the project design phase and prior to project commencement. Appropriate survey protocol will be adhered to and all beach jacquemontia plants will be flagged. Identified pipeline routes and associated construction activities will avoid flagged sites. For projects where dune features are incorporated into the project design, additional habitat may be made available for natural recruitment and colonization as well as reintroduction of plants. Considering the limited distribution and numbers of existing populations, fragmentation and degradation of habitat, and the potential for stochastic natural events; projects that can not avoid direct impacts to existing plants are outside the scope of this assessment and will be addressed in a separate document.

d. Effect Determination

Considering that the habitat requirements for beach jacquemontia are located outside of the beach placement area of sediment, direct impacts from sediment placement will not occur. In areas where known populations exist, surveys will be conducted and pipeline routes will avoid identified beach jacquemontia plants. For projects that can not avoid direct impacts from pipeline routes and associated actions will be addressed in a separate document. Therefore, considering the implementation of these protection and avoidance measures, the placement of sediment on the beach and associated construction actions may affect but will not likely adversely affect beach jacquemontia.

7.02.10 Deltoid Spurge.

a. Status. Threatened

b. Background.

Deltoid spurge (*Chamaesyce deltoidea ssp. deltoidea*) is a shore-lived perennial herb and can be found at low elevations on thin sandy soils or directly on limestone, specifically in the pine rocklands, coastal flats, coastal grasslands, and beach ridges of Miami-Dade and Monroe counties, Florida. It is endemic to South Florida and is abundant on Cape Sable (hammock edges, open grassy prairies, and backdune swales) and is found throughout the Keys (semi-exposed limestone shores, open calcareous salt flats, pine rocklands, calcareous sands of beach ridges, and along disturbed roadsides) in small numbers. Habitat loss from development, fire suppression, and invasive exotics continues to threaten this species.

c. Potential Impacts.

The placement of sediment on the beach and associated construction operations will not occur within Deltoid spurge habitat and; therefore, will not impact existing populations or degrade potential habitat in South Florida.

d. Effect determination.

The placement of sediment on the beach will not affect Deltoid spurge.

8.00 Cumulative Impacts (Past, Present, and Reasonably Foreseeable Future Actions)

The Corps has been involved with placing sand on Florida's beaches for the past several decades. Even though there have been efforts to reduce or eliminate Federal participation in shore protection activity, Congress is likely to continuing funding of such efforts into the future. The Corps' regulatory responsibility for such activities (for permitting both non-Corps projects and Corps projects constructed by the non-Federal sponsor for reimbursement) is also expected to continue. A large portion of Florida's beaches are in an eroding state if not "critically eroded". There is no reason to believe that the forces causing erosion and coastal flooding are likely to diminish in the foreseeable future.

Measures to counter erosion and storm damage include sand-bypassing, placement of sand from navigation dredging on the beach (or near-shore or dune), placement of sand from off-shore (or other sources) for beach renourishment, and construction of groins or breakwaters. The absence of these measures would, for many eroding shorelines, result in either a loss of property (structures and natural or cultural resources) or pressure for alternative measures such as shoreline hardening.

The placement of sand on the beach can be disruptive (especially in first year or two following construction) to threatened or endangered species and their habitat. While we will seek measures to minimize such impacts (see part 9.00 below), impacts are likely to occur for present and future sand placement activities.

Whether the amount or frequency of beach renourishment and other storm damage reduction measures will increase in the future depends largely on the future level of erosion and hydrodynamic forces such as the frequency and intensity of storm events and the rise in sea level. We can not eliminate the possibility that these forces will trend upward in the future resulting in an increase in the magnitude and/or frequency of storm damage reduction activities. For planning purposes, the Corps treats sea level rise in accordance with planning regulations (ER 1105-2-100, Appendix E, Section IV) based on the National Research Council study on sea level change (Responding to Changes in Sea Level: Engineering Implications, 1987). The strategy to combat erosion and storm damage (verses retreat) will likely continue (especially for areas of high economic or social value) unless it becomes economically impractical or politically unacceptable.

9.00 Commitments to Reduce Impacts to Listed Species

The following list is a summary of environmental commitments to protect listed species related to the construction and maintenance of the proposed actions. These commitments address agreements with the USFWS, mitigation measures, and construction practices.

Species	Commitments to Reduce Impacts to Listed Species
Bald Eagles	(1) Implementation of USFWS "Draft National Bald Eagle Management Guidelines (February 2006)." The USACE will implement the most current recommended draft guidelines provided by the Service until a final document is published, upon which, the final guidelines will be adhered to
Roseate Tern	(2) Avoid identified major nesting colony sites and avoid breeding and nesting time frames
Piping Plover	(3) Adhere to appropriate windows to the maximum extent practicable
	(4) Implement survey guidelines for non-breeding shorebirds when appropriate
	(5) Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting
	(6) Avoid impacts to the primary constituent elements of piping plover critical habitat to the maximum extent practicable
	(7) Pre-project surveys will be performed to assess the presence of and/or potential for washover fan formation
	(8) The USACE will work with the USFWS to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (i.e. washover fans)
	(9) The USACE will work with the State of Florida DEP to consider the value and context of inlet habitat features (i.e. emergent spits, sand bars, etc.) within each inlets management plan and adjust future dredging frequencies, to the maximum extent practicable, so that

adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex

Snowy Plover

(10) Adhere to appropriate breeding windows to the maximum extent practicable

(11) Dune features will be constructed and planted, to the maximum extent practicable, to minimize impacts to existing breeding grounds by maintaining and enhancing existing nesting habitat features as well as creating nesting habitat in areas that did not previously support nesting snowy plovers

(12) The USACE will work with the State of Florida DEP to consider the value and context of inlet habitat features (i.e. emergent spits, sand bars, etc.) within each inlets management plan and adjust future dredging frequencies, to the maximum extent practicable, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex

(13) If the breeding season can not be avoided, the USACE will work with the resource agencies in order to develop and implement a sufficient monitoring plan in order to avoid construction impacts to snowy plover hatchlings

(14) Escarpments will be leveled prior to the breeding and nesting season

Red Knot

(15) Beach placement activities will be constructed to allow for un-impacted foraging habitat locations and avoid large scale disruption to benthic invertebrates to the maximum extent practicable

(16) Avoid roosting timeframes or provide appropriate buffers around existing roosting habitat during construction operations

Manatee

(17) Adhere to the “Manatee Protection Conditions”

(18) Use of observers during hopper dredge operations

Beach Mice

(19) Pipeline routes for beach construction projects will avoid identified primary constituent elements for critical habitat to the maximum extent practicable

(20) Implementation of a trapping and relocation plan if avoidance alternatives are not practical

(21) Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice.

Sea turtles

(22) Avoid sea turtle nesting season to the maximum extent practicable

(23) Implement sea turtle nest monitoring and relocation plan if nesting window can not be adhered to

(24) Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 ft.) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the USFWS

(25) Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized and nest placement is not subject to inundation or wash out

(26) Temporary storage of pipes and equipment will be located off the beach to the maximum extent practicable

(27) The USACE will continue to work with the Florida DEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts

(28) USFWS compaction assessment guidelines will be followed and tilling will be performed where appropriate.

(29) All lighting associated with project construction will be minimized to the maximum extent practicable, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements

Beach Jacquemontia

(30) For projects where known populations of beach jacquemontia exist, plant surveys will be performed, through coordination with USFWS, during the project design phase and prior to project commencement. Appropriate survey protocol will be adhered to and all beach jacquemontia plants will be flagged

(31) Identified pipeline routes and associated construction activities will avoid flagged sites

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10.00 Summary Effect Determination

It has been determined that the proposed actions:

-**may adversely affect** the hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, green sea turtle, piping plover, beach mice (if impacts to critical habitat features can not be avoided), and snowy plover (if breeding and nesting windows can not be adhered to).

-**may affect but will not likely adversely affect** the bald eagle, roseate tern, red knot, manatee, beach jacquemontia, beach mice (if impacts to critical habitat features can be avoided), and snowy plover (if breeding and nesting windows are adhered to).

-**will not affect** the deltoid spurge.

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APPENDICES

Appendices are available on the internet at
http://planning.saj.usace.army.mil/envprot2/RBA/index.htm

Appendix 1 FDEP Sediment Compatibility Requirements

Appendix 2 Past and Present Shore Protection Activities

Appendix 3 Piping Plover Critical Habitat

Appendix 4 Shorebird Survey Guidelines

Appendix 5 Florida Red Knot Location and Density

Appendix 6 Beach Mice Critical Habitat

Appendix 7 Sea Turtle Nesting Data

- County Maps
- Green Sea Turtle
- Leatherback
- Loggerhead
- Hawksbill and Kemps Ridley

Appendix 8 Sea turtle monitoring guidelines